NUS CORPORATION
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141932

FINAL DRAFT
PRELIMINARY ASSESSMENT
SERVOMETER CORPORATION
CEDAR GROVE, NEW JERSEY

FIELD INVESTIGATION TEAM ACTIVITIES AT UNCONTROLLED HAZARDOUS SUBSTANCES FACILITIES — ZONE I

NUS CORPORATION
SUPERFUND DIVISION

02-8904-65-PA
REV. NO. 0

FINAL DRAFT
PRELIMINARY ASSESSMENT
SERVOMETER CORPORATION
CEDAR GROVE, NEW JERSEY

PREPARED UNDER

TECHNICAL DIRECTIVE DOCUMENT NO. 02-8904-65
CONTRACT NO. 68-01-7346

FOR THE

ENVIRONMENTAL SERVICES DIVISION
U.S. ENVIRONMENTAL PROTECTION AGENCY

JUNE 23, 1989

NUS CORPORATION
SUPERFUND DIVISION

SUBMITTED BY:

JOANN L. WAGNER
PROJECT MANAGER

PHILIP J. SOLINSKI
SITE MANAGER

REVIEWED/APPROVED BY:

RONALD M. NAMAN
FIT OFFICE MANAGER

POTENTIAL HAZARDOUS WASTE SITE PRELIMINARY ASSESSMENT

PART I: SITE INFORMATION

1. Site Name/Alias Servometer Corporation

   Street 501 Little Falls Road

   City Cedar Grove State New Jersey Zip 07009

2. County Essex County Code 13 Cong. Dist. 11

3 EPA ID No. NJD002138543

4. Latitude 40° 52′ 10″ N. Longitude 074° 13′ 26″ W.

   USGS Quad. Orange, New Jersey

5. Owner Servometer Corporation Tel. No. (201) 785-4630

   Street 501 Little Falls Road

   City Cedar Grove State New Jersey Zip 07009

6. Operator Servometer Corporation Tel. No. (201) 785-4630

   Street 501 Little Falls Road

   City Cedar Grove State New Jersey Zip 07009

7. Type of Ownership

   ☒ Private ☐ Federal ☐ State
   ☐ County ☐ Municipal ☐ Unknown ☐ Other ______

8. Owner/Operator Notification on File

   ☒ RCRA 3001 Date 8/14/80 ☐ CERCLA 103c Date ______
   ☐ None ☐ Unknown

9. Permit Information

Permit	Permit No.	Date Issued	Expiration Date	Comments
RCRA Part A	NJD002138543	10/81		TSD Status terminated 12/88
NJPDES	NJ0027847	10/9/84	11/30/89	Modified in 1987 to include monitoring for discharges to groundwater

10. Site Status

☒ Active ☐ Inactive ☐ Unknown

11. Years of Operation 1974 to Present

12. Identify the types of waste units (e.g., landfill, surface impoundment, piles, stained soil, above- or below-ground tanks or containers, land treatment, etc.) on site. Initiate as many waste unit numbers as needed to identify all waste sources on site.

(a) Waste Management Areas

Waste Unit No.	Waste Unit Type	Facility Name for Unit
1	6,000-Gallon Underground Storage Tank	Caustic Waste Storage Tank
2	6,000-Gallon Aboveground Storage Tank	Caustic Waste Storage Tank
3	Waste Tank	Batch Treatment Tank
4	Solvent Vapor Degreaser	1,1,1-Trichloroethane Unit
5	Wastewater Treatment Facility	Wastewater Treatment Facility
6	Drum Storage Area	Drum Storage Area

(b) Other Areas of Concern

Identify any miscellaneous spills, dumping, etc. on site; describe the materials and identify their locations on site.

There are no known or reported spills on site. However, any spills within the building would be pumped to the waste treatment area.

13. Information available from

Contact Amy Brochu Agency U.S. EPA Tel. No. (201) 906-6802

Preparer Philip J. Solinski Agency NUS Corp. Region 2 FIT Date 6/23/89

PART II: WASTE SOURCE INFORMATION

For each of the waste units identified in Part I, complete the following six items.

Waste Unit 1 - 6,000-Gallon Underground Storage Tank Caustic Waste Storage Tank

1. **Identify the RCRA status and permit history, if applicable, and the age of the waste unit.**

   Servometer Corporation has been a RCRA facility since 1980. The company was originally identified as a hazardous waste treatment, storage, or disposal (TSD) facility, but in December 1988 its TSD status was terminated. Since 1984, Servometer has been permitted to discharge to surface water under the New Jersey Pollutant Discharge Elimination System (NJPDES). In 1987 that permit was modified to include monitoring for any past and/or potential discharges to groundwater. The carbon steel underground storage tank was utilized from the fall of 1974 to the spring of 1987. The tank was removed, and soil sampling was performed on December 7, 1988.

2. **Describe the location of the waste unit and identify clearly on the site map.**

   The tank was located on the north side of the building to the rear of the building.

3. **Identify the size or quantity of the waste unit (e.g., area or volume of a landfill or surface impoundment, number and capacity of drums or tanks). Specify the quantity of hazardous substances in the waste unit.**

   The tank had a maximum capacity of 6,000 gallons.

4. **Identify the physical state(s) of the waste type(s) as disposed of in the waste unit. The physical state(s) should be categorized as follows: solid, powder or fines, sludge, slurry, liquid, or gas.**

   The physical state of the waste was liquid.

5. **Identify specific hazardous substance(s) known or suspected to be present in the waste unit.**

   Caustic waste from dissolution of aluminum from nickel parts was stored in the tank.

6. **Describe the containment of the waste unit as it relates to contaminant migration via groundwater, surface water, and air.**

   The underground tank rested on a concrete slab. Upon the tank's removal, soil sampling was performed. All of the samples showed no contamination. Only one sample showed a high pH.

Ref. Nos. 14, 21, 22, 23, 25, 26, 27, 28

PART II: WASTE SOURCE INFORMATION

For each of the waste units identified in Part I, complete the following six items.

Waste Unit 2 - 6,000-Gallon Aboveground Storage Tank   Caustic Waste Storage Tank

1. **Identify the RCRA status and permit history, if applicable, and the age of the waste unit.**

   Servometer Corporation has been a RCRA facility since 1980. The company was originally identified as a hazardous waste teatment, storage, or disposal (TSD) facility, but in December 1988 its TSD status was terminated. Since 1984, Servometer has been permitted to discharge to surface water under the NJPDES. In 1987 that permit was modified to include monitoring for any past and/or potential discharges to groundwater. The fiberglass aboveground storage tank has been in operation since spring 1987.

2. **Describe the location of the waste unit and identify clearly on the site map.**

   The tank is located on the south side of the building to the rear.

3. **Identify the size or quantity of the waste unit (e.g., area or volume of a landfill or surface impoundment, number and capacity of drums or tanks). Specify the quantity of hazardous substances in the waste unit.**

   The tank has a maximum capacity of 6,000 gallons.

4. **Identify the physical state(s) of the waste type(s) as disposed of in the waste unit. The physical state(s) should be categorized as follows: solid, powder or fines, sludge, slurry, liquid, or gas.**

   The physical state of the waste is liquid.

5. ***Identify specific hazardous substance(s) known or suspected to be present in the waste unit.***

   Caustic waste from dissolution of aluminum from nickel parts is known to be stored in the tank for less than 90 days.

6. **Describe the containment of the waste unit as it relates to contaminant migration via groundwater, surface water, and air.**

   The waste is in a closed container surrounded by a secondary containment system. The New Jersey Department of Environmental Protection (NJDEP) requirements for the secondary containment system include a capacity of 6,000 gallons, and an 8-inch-thick reinforced concrete pad with a permeability rating not greater than 10^{-7} cm/sec.

Ref. Nos. 14, 22, 23, 24, 27, 28

PART II: WASTE SOURCE INFORMATION

For each of the waste units identified in Part I, complete the following six items.

Waste Unit 3 - Waste Tank Batch Treatment Tank

1. **Identify the RCRA status and permit history, if applicable, and the age of the waste unit.**

   Servometer has been a RCRA facility since 1980. The company began its operations in 1974.

2. **Describe the location of the waste unit and identify clearly on the site map.**

   The batch treatment storage tank is located near the wastewater treatment facility, which is in the southeast corner of the building.

3. **Identify the size or quantity of the waste unit (e.g., area or volume of a landfill or surface impoundment, number and capacity of drums or tanks). Specify the quantity of hazardous substances in the waste unit.**

   The capacity of the waste tank is 330 gallons.

4. **Identify the physical state(s) of the waste type(s) as disposed of in the waste unit. The physical state(s) should be categorized as follows: solid, powder or fines, sludge, slurry, liquid, or gas.**

   The physical state of the waste is liquid.

5. **Identify specific hazardous substance(s) known or suspected to be present in the waste unit.**

   The tank contains sulfuric acid solution with dissolved aluminum and nickel, plus miscellaneous spills and leakage from the plating department. These spills could include nitric acid and copper.

6. **Describe the containment of the waste unit as it relates to contaminant migration via groundwater, surface water, and air.**

   The waste unit is within the building. All spills enter the floor drains and are then pumped to the batch treatment tank in the wastewater treatment area.

Ref. Nos. 14, 21, 22, 23, 24, 27, 28

PART II: WASTE SOURCE INFORMATION

For each of the waste units identified in Part I, complete the following six items.

Waste Unit 4 - Solvent Vapor Degreaser 1,1,1-Trichloroethane Unit

1. **Identify the RCRA status and permit history, if applicable, and the age of the waste unit.**

   Servometer began operations in 1974 and has been a RCRA facility since 1980.

2. **Describe the location of the waste unit and identify clearly on the site map.**

   The unit is located within the cleaning room in the middle of the building.

3. **Identify the size or quantity of the waste unit (e.g., area or volume of a landfill or surface impoundment, number and capacity of drums or tanks). Specify the quantity of hazardous substances in the waste unit.**

   The unit holds 275 gallons of solvent.

4. **Identify the physical state(s) of the waste type(s) as disposed of in the waste unit. The physical state(s) should be categorized as follows: solid, powder or fines, sludge, slurry, liquid, or gas.**

   The physical states of the wastes are liquid and sludge.

5. **Identify specific hazardous substance(s) known or suspected to be present in the waste unit.**

   The solvent 1,1,1-trichloroethane and associated still bottoms are known to be present.

6. **Describe the containment of the waste unit as it relates to contaminant migration via groundwater, surface water, and air.**

   The unit is located within the building. The solvent is recycled in a closed loop within the unit. Still bottoms from the unit are removed within 90 days of generation. Migration is unlikely.

Ref. Nos. 14, 21, 22, 27, 28

PART II: WASTE SOURCE INFORMATION

For each of the waste units identified in Part I, complete the following six items.

Waste Unit 5 - Wastewater Treatment Facility Wastewater Treatment Facility

1. **Identify the RCRA status and permit history, if applicable, and the age of the waste unit.**

   Servometer began operations in 1974 and has been a RCRA facility since 1980. The company was originally identified as a hazardous waste treatment, storage, or disposal (TSD) facility, but in December 1988 its TSD status was terminated. Since 1984, Servometer has been permitted to discharge to surface water under the NJPDES.

2. **Describe the location of the waste unit and identify clearly on the site map.**

   The treatment facility is located in the southeast corner of the building.

3. **Identify the size or quantity of the waste unit (e.g., area or volume of a landfill or surface impoundment, number and capacity of drums or tanks). Specify the quantity of hazardous substances in the waste unit.**

   The waste treatment facility treats 12,000 gallons per day and releases the effluent under state permit to the Peckman River. A tank for the storage of sludge resulting from the waste treatment process has a capacity of approximately 1,500 gallons.

4. **Identify the physical state(s) of the waste type(s) as disposed of in the waste unit. The physical state(s) should be categorized as follows: solid, powder or fines, sludge, slurry, liquid, or gas.**

   The physical states of the wastes are liquid and sludge.

5. **Identify specific hazardous substance(s) known or suspected to be present in the waste unit.**

   Process waters from the nickel rinse, cyanide rinse, chrome rinse, sodium hydroxide rinse, and floor spillage are known to be treated. The sludge resulting from the waste treatment process is removed from the site within 90 days of its generation.

6. **Describe the containment of the waste unit as it relates to contaminant migration via groundwater, surface water, and air.**

   All liquid wastes are treated before release into the Peckman River.

Ref. Nos. 14, 21, 22, 23, 27, 28

PART II: WASTE SOURCE INFORMATION

For each of the waste units identified in Part I, complete the following six items.

Waste Unit 6 - Drum Storage Area Drum Storage Area

1. **Identify the RCRA status and permit history, if applicable, and the age of the waste unit.**

   Servometer began operations in 1974 and has been a RCRA facility since 1980.

2. **Describe the location of the waste unit and identify clearly on the site map.**

   According to a site map included in the facility's 1980 hazardous waste permit application, the drums are located along the south wall in the plating department.

3. **Identify the size or quantity of the waste unit (e.g., area or volume of a landfill or surface impoundment, number and capacity of drums or tanks). Specify the quantity of hazardous substances in the waste unit.**

   There are nine 55-gallon drums shown on the 1980 site map.

4. **Identify the physical state(s) of the waste type(s) as disposed of in the waste unit. The physical state(s) should be categorized as follows: solid, powder or fines, sludge, slurry, liquid, or gas.**

   The physical state of the wastes are liquid.

5. **Identify specific hazardous substance(s) known or suspected to be present in the waste unit.**

   According to the 1980 submittal, the solvent 1,1,1-trichloroethane and waste oil are stored in five drums, and acid stripper waste was stored in the four other drums.

6. **Describe the containment of the waste unit as it relates to contaminant migration via groundwater, surface water, and air.**

   The drums are located within the building; therefore, migration is unlikely.

Ref. Nos. 14, 22, 28

PART III: HAZARD ASSESSMENT

GROUNDWATER ROUTE

1. **Describe the likelihood of a release of contaminant(s) to the groundwater as follows: observed, alleged, potential, or none. Identify the contaminant(s) detected or suspected, and provide a rationale for attributing the contaminant(s) to the facility.**

There is no potential for a release of contaminants to groundwater because the underground tank was removed. The soil around the tank was tested and found to be uncontaminated. The aboveground storage tank, approved by the NJDEP, has no potential for a release to groundwater, because of its containment system. All other waste units are within the building. All waste is either treated and discharged to surface water or is shipped off site for proper disposal.

Ref. Nos. 14, 21, 25, 26, 29

2. **Describe the aquifer of concern; include information such as depth, thickness, geologic composition, permeability, overlying strata, confining layers, interconnections, discontinuities, depth to water table, groundwater flow direction.**

Rocks of the Brunswick Formation are the main source of groundwater in Essex County. The formation consists predominantly of interbedded brown, reddish-brown, and gray shale, sandy shale, sandstone, and some conglomerate. Between the First and Second Watchung Mountains, the formation is predominantly sandstone. The valley in between the mountains is underlain by stratified drift. The depth of this drift is between 30 and 50 feet; underneath this drift, bedrock is found. The primary pore spaces in consolidated rocks of the Brunswick Formation are so small that an insignificant quantity of water, if any, moves through them under natural hydraulic gradients. However, a joint and fracture system that has developed provides secondary porosity, and it is largely in and through these openings that storage and movement of groundwater take place. The groundwater movement in the Brunswick Formation is to the north-northeast, along the strike of the formation; the Peckman River flows in the same direction. Depth to the water table is between 10 and 20 feet below the surface.

Ref. Nos. 1, 2, 3, 4

3. **Is a designated sole source aquifer within 3 miles of the site?**

The Brunswick Shale and Sandstone Aquifer is designated as a sole source aquifer in the Ridgewood area of northern New Jersey. However, this area does not fall within the 3-mile radius of the site.

Ref. Nos. 5, 6

4. **What is the depth from the lowest point of waste disposal/storage to the highest seasonal level of the saturated zone of the aquifer of concern?**

The elevation of the facility is approximately 177 feet. The depth of the underground tank is unknown, but is assumed to be 6 feet below the ground surface. The elevation of the nearby river is approximately 172 feet. Therefore, the depth from the lowest point of waste storage to the highest seasonal level of the saturated zone is assumed to be 0 feet.

Ref. Nos. 3, 4, 7, 13, 21

5. What is the permeability value of the least permeable continuous intervening stratum between the ground surface and the aquifer of concern?

The stratified drift between the ground surface and the water table consists mostly of stratified sand and gravel. The approximate range of hydraulic conductivity is from 10^{-5} to 10^{-3} cm/sec.

Ref. Nos. 2, 7

6. What is the net annual precipitation for the area?

Approximately 16 inches.

Ref. No. 7

7. Identify uses of groundwater within 3 miles of the site (i.e., private drinking source, municipal source, commercial, industrial, irrigation, unusable).

Groundwater is used for drinking water during peak demands in Montclair and is also used for drinking water by Essex County Hospital Center. Two country clubs within 3 miles of the site use groundwater for recreational and irrigation purposes. The Upper Montclair Country Club also uses groundwater for drinking purposes.

Ref. Nos. 6, 8, 9, 10, 11, 30, 31

8. What is the distance to and depth of the nearest well that is currently used for drinking or irrigation purposes?

Distance 1.7 miles   **Depth** Depth 300 ft

Ref. Nos. 8, 12, 13

9. Identify the population served by the aquifer of concern within a 3-mile radius of the site.

Approximately 42,000.

Ref. Nos. 9, 11

SURFACE WATER ROUTE

10. Describe the likelihood of a release of contaminant(s) to surface water as follows: observed, alleged, potential, or none. Identify the contaminant(s) detected or suspected, and provide a rationale for attributing the contaminants to the facility.

The Servometer Corporation is currently permitted to discharge effluent from its wastewater treatment system into the Peckman River under New Jersey Pollutant Discharge Elimination System (NJPDES) permit No. NJ0027847. The system treats various spent process solutions containing dissolved metals (aluminum, nickel, and copper), acids, alkalies, and cyanides.

Ref. No. 14

11. **Identify and locate the nearest downslope surface water. If possible, include a description of possible surface drainage patterns from the site.**

The Peckman River is located approximately 30 feet from the site boundary to the west. A drainage path extends from the rear of the building for a distance of approximately 210 feet to the river.

Ref. Nos. 4, 14, 27

12. **What is the facility slope in percent? (Facility slope is measured from the highest point of deposited hazardous waste to the most downhill point of the waste area or to where contamination is detected.)**

The facility slope as defined cannot be calculated, as there were no known wastes deposited on site.

Ref. No. 4

13. **What is the slope of the intervening terrain in percent? (Intervening terrain slope is measured from the most downhill point of the waste area to the probable point of entry to surface water.)**

The intervening terrain slope is estimated to be less than 3 percent.

Ref. Nos. 4, 13

14. **What is the 1-year 24-hour rainfall?**

Approximately 2.7 inches.

Ref. No. 7

15. **What is the distance to the nearest downslope surface water? Measure the distance along a course that runoff can be expected to follow.**

Approximately 210 feet.

Ref. Nos. 4, 27

16. **Identify uses of surface waters within 3 miles downstream of the site (i.e., drinking, irrigation, recreation, commercial, industrial, not used).**

Surface water downstream is used for hydroelectric power generation and possibly some recreational fishing.

Ref. No. 15

17. **Describe any wetlands, greater than 5 acres in area, within 2 miles downstream of the site. Include whether it is a freshwater or coastal wetland.**

There are no wetlands downstream of the site.

Ref. Nos. 13, 15, 16

18. Describe any critical habitats of federally listed endangered species within 2 miles of the site along the migration path.

There are no critical habitats of federally listed endangered species within 2 miles of the site.

Ref. Nos. 16, 17

19. What is the distance to the nearest sensitive environment along or contiguous to the migration path (if any exist within 2 miles)?

There are no sensitive environments within 2 miles of the site.

Ref. Nos. 13, 16, 17

20. Identify the population served or acres of food crops irrigated by surface water intakes within 3 miles downstream of the site and the distance to the intake(s).

There are no surface water intakes 3 miles downstream of the site.

Ref. Nos. 13, 15, 18

21. What is the state water quality classification of the water body of concern?

The Peckman River is classified as FW2-nontrout.

Ref. No. 19

22. Describe any apparent biota contamination that is attributable to the site.

There is no apparent biota contamination that is attributable to the site.

Ref. Nos. 4, 14

AIR ROUTE

23. Describe the likelihood of a release of contaminant(s) to the air as follows: observed, alleged, potential, none. Identify the contaminant(s) detected or suspected, and provide a rationale for attributing the contaminant(s) to the facility.

The potential for a release of contaminants to the air exists because chlorine and cyanide are used in one of the processes on site. This process results in the production of hydrogen cyanide and/or cyanogen chloride gases under improper pH conditions.

Ref. No. 14

24. What is the population within a 4-mile radius of the site?

Approximately 206,400 people.

Ref. No. 20

FIRE AND EXPLOSION

25. Describe the potential for a fire or explosion to occur with respect to the hazardous substance(s) known or suspected to be present on site. Identify the hazardous substance(s) and the method of storage or containment associated with each.

There is a potential for fire or explosion on site. If some of the chemicals used or wastes generated on site were mixed with each other, there is a potential for a violent reaction.

Ref. Nos. 7, 14

26. What is the population within a 2-mile radius of the hazardous substance(s) at the facility?

Approximately 37,400 people.

Ref. No. 20

DIRECT CONTACT/ON-SITE EXPOSURE

27. Describe the potential for direct contact with hazardous substance(s) stored in any of the waste units on site or deposited in on-site soils. Identify the hazardous substance(s) and the accessibility of the waste unit.

Workers on site may be exposed to hazardous substances due to the nature of the processes involved. The waste tank may be accessible to the public, as there is no fence to keep people away. The potential for contact by the public with hazardous substances inside the building is minimal because of a security system.

Ref. Nos. 4, 14

28. How many residents live on a property whose boundaries encompass any part of an area contaminated by the site?

There are no known areas of contaminaton attributable to the site and no residential properties immediately adjacent to the site.

Ref. No. 4

29. What is the population within a 1-mile radius of the site?

Approximately 10,200 people.

Ref. No. 20

PART IV: SITE SUMMARY AND RECOMMENDATIONS

Servometer Corporation, located in Cedar Grove, Essex County, New Jersey, is an active facility which began its operations in 1974. The company is privately owned and is located in a mixed residential and industrial area. The 8-acre site is in close proximity to the Peckman River.

The Servometer Corporation manufactures miniature metal bellows, bellows assemblies, couplings, and contacts for the aerospace and control valve industries. The manufacturing operation involves the electrodeposition (electroforming) of copper and nickel onto aluminum mandrels. Once the desired thickness is obtained, the aluminum mandrels are dissolved using a caustic solution.

Servometer operates a wastewater treatment system on site which treats various spent process solutions containing dissolved metals, acids, alkalies, and cyanides. The system also treats rinse waters that flow continuously while the plant is operating. These rinse waters represent a more voluminous but less concentrated source of wastes as compared to the process solutions. The effluent from the treatment system is discharged to the Peckman River under New Jersey Pollutant Discharge Elimination System (NJPDES) permit No. NJ0027847.

The Servometer Corporation was classified as a hazardous waste treatment, storage, or disposal (TSD) facility, EPA I.D. No. NJD002138543, from 1980 to December 1988. Currently, the company is listed only as a generator. Hazardous wastes generated by the facility include caustic waste, waste acid, still bottoms from a solvent (1,1,1-trichloroethane) recovery unit, wastewater treatment sludge, and waste metal working oils. All hazardous wastes are removed from the site within 90 days of generation.

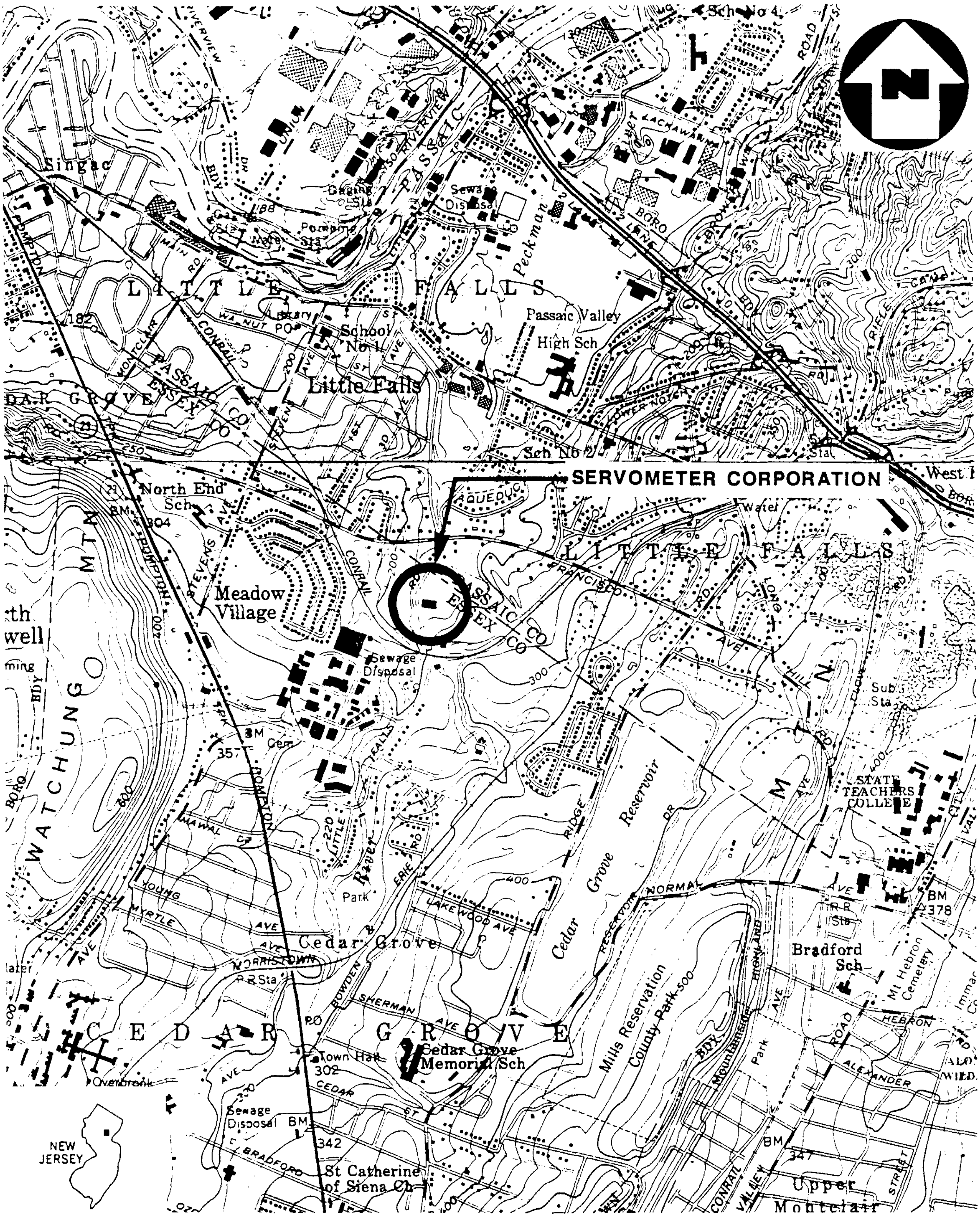
From 1974 to spring 1987, the caustic waste was stored in a 6,000-gallon underground storage tank. Four wells were installed in early 1988 to monitor for any past and/or potential discharges to groundwater. The tank was removed in December 1988. Four soil samples collected from the area of the tank showed no contamination. Only one soil sample had an elevated pH. Since spring 1987, Servometer has been using a 6,000-gallon aboveground tank for the storage of caustic waste.

Servometer Corporation has complied with all New Jersey Department of Environmental Protection (NJDEP) requests. There have been no reported spills or violations. As a result of an October 1988 NJDEP inspection, the company was given an acceptable rating. Therefore, a recommendation of **NO FURTHER REMEDIAL ACTION PLANNED (NFRAP)** is being made.

ATTACHMENT 1

SERVOMETER CORPORATION
CEDAR GROVE, NEW JERSEY

CONTENTS



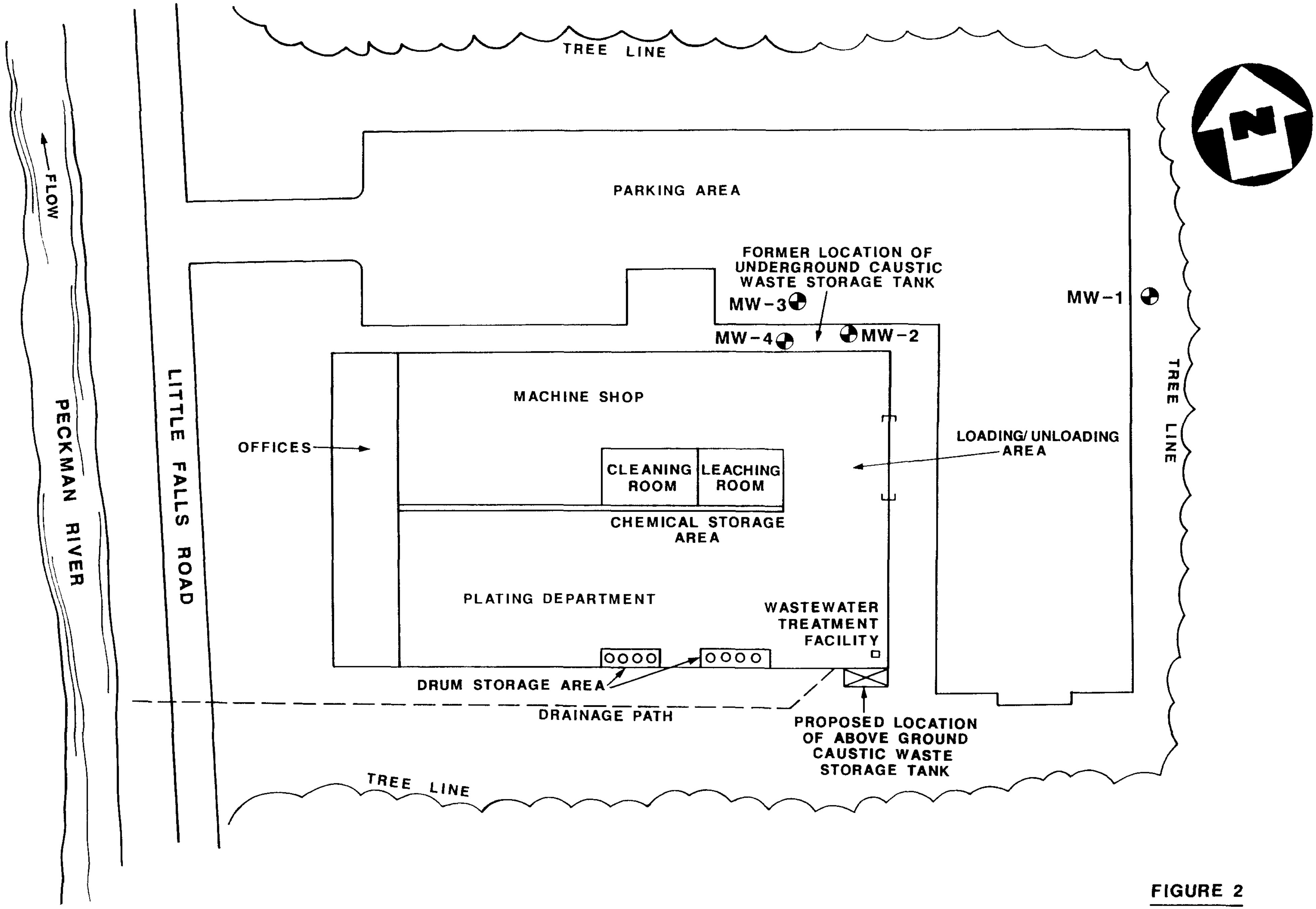
(QUAD) ORANGE, N.J.

FIGURE 1

SITE LOCATION MAP
SERVOMETER CORPORATION,
CEDAR GROVE, N.J.

SCALE : 1"=2000'

NUS CORPORATION



02-8904-65-PA
Rev. No. 0

FIGURE 2

NUS CORPORATION

SITE MAP

SERVOMETER CORPORATION, CEDAR GROVE, N.J.

(NOT TO SCALE)

EXHIBIT A

PHOTOGRAPH LOG

SERVOMETER CORPORATION
CEDAR GROVE, NEW JERSEY

OFF-SITE RECONNAISSANCE: MAY 9, 1989

SERVOMETER CORPORATION
CEDAR GROVE, NEW JERSEY
MAY 9, 1989

PHOTOGRAPH INDEX

Photo Number	Description	Time
1P-3	Photo looking southeast at site.	1430
1P-4	Photo looking east at drainage pathway.	1431
1P-5	Photo looking south at Peckman River.	1438
	All photographs by P. Solinski.	

SERVOMETER CORPORATION
CEDAR GROVE, NEW JERSEY

1P-3 May 9, 1989 1430
Photo looking southeast at site.

1P-4 May 9, 1989 1431
Photo looking east at drainage pathway.

SERVOMETER CORPORATION
CEDAR GROVE, NEW JERSEY

1P-5 May 9, 1989 1438
Photo looking south at Peckman River.

ATTACHMENT 2

REFERENCES

1. New Jersey Department of Conservation and Economic Development, Geologic Map of New Jersey, Atlas Sheet No. 40, 1950.

2. Nichols, William D. Ground-Water Resources of Essex County, New Jersey. Special Report No. 28. State of New Jersey Department of Conservation and Economic Development, Division of Water Policy and Supply, 1968.

3. Carswell, L.D. and Rooney, J.G. Summary of Geology and Ground-Water Resources of Passaic County, New Jersey. U.S. Geological Survey, Water-Resource Investigations 76-75, June 1976.

4. Preliminary Assessment Off-Site Reconnaissance Information Reporting Form, Servometer Corporation, TDD No. 02-8904-65, NUS Corp. Region 2 FIT. May 9, 1989.

5. Federal Register, Vol. 49, No. 16, Tuesday, January 24, 1984, p. 2944.

6. Telecon Note: Conversation between W. Kowalski, Township of Cedar Grove Engineering Office, and P. Solinski, NUS Corporation, May 10, 1989.

7. Uncontrolled hazardous waste site ranking system, A user's manual, 40 CFR, Part 300, Appendix A, 1986.

8. N.J. Department of Environmental Protection, Division of Water Resources, Bureau of Water Allocation, Water Withdrawal Points and NJGS Case Index Sites within 5.0 miles of Latitude 404858 and Longitude 741127, June 25, 1988.

9. Project Note: From Stanley B. Shulfer, NUS Corporation, regarding Town of Montclair Water Wells. July 6, 1988.

10. Telecon Note: Conversation between Kevin Ryan, Montclair Water Bureau, and Stanley B Shulfer, NUS Corporation, June 30, 1988.

11. Telecon Note: Conversation between Henry Bogdanski, Essex County Hospital Center, and Stanley B. Shulfer, NUS Corporation, July 13, 1988.

12. Michna, Vlado. Staff Report, In the matter of Town of Montclair, Application No. 5245 to renew permit to divert water from three wells in the Town of Montclair, Essex County, N.J. Department of Environmental Protection, Water Allocation Office.

13. Three-Mile Vicinity Map, based on U.S. Department of Interior, Geological Survey Topographic Maps, 7.5 minute series, "Orange Quadrangle, N.J.", "Pompton Plains Quadrangle, N.J.", "Paterson Quadrangle, N.J." (all 1955, revised 1981), "Caldwell Quadrangle, N.J.", 1954, revised 1981.

14. Lancy Laboratories Division, Lancy International, Inc. Emergency Plan and Preparedness, Prevention and Contingency Plan for Servometer Corporation, May 1984.

15. Telecon Note: Conversation between Mr Deblock, West Paterson Water Pollution Control, and P. Solinski, NUS Corporation, May 10, 1989

REFERENCES (CONT'D)

16. U.S. Department of Interior, U.S. Fish and Wildlife Service, Atlantic Coast Ecological Inventory, Newark, N.J. - N.Y. - PA, 1980.

17. New York State Department of Environmental Conservation, Significant Habitat Overlay, Newark Quadrangle, March 1981, revised April 1987.

18. State of New Jersey, Department of Environmental Protection, Water Supply Overlay Sheet No. 26, August 1975.

19. New Jersey Department of Environmental Protection (NJDEP), Surface Water Quality Standards, N.J.A.C. 7:9-4 and N.J.A.C. 7:9-4.1 et. seq., May 1985.

20. General Software Corporation, Graphical Exposure Modeling System (GEMS). Landover, Maryland, 1986.

21. Letter from Robert Berg, Chief, Bureau of Ground Water Quality Management, NJDEP, to Peter Holowachuk, Servometer Corporation, August 20, 1987. Re: Response to Comments and Issuance of Final NJPDES Permit.

22. U.S. EPA, Notification of Hazardous Waste Activity, EPA Form 8700-12 (6-80), Servometer Corporation, EPA I.D. Number NJD002138543, August 12, 1980.

23. Letter from Ernest J. Kuhlwein, Chief, Bureau of Hazardous Waste Engineering, NJDEP, to Peter J. Holowachuk, Servometer Corporation, December 9, 1988.

24. Letter from Frank Coolick, Acting Assistant Director, Hazardous Waste Regulation Element, NJDEP, to Peter Holowachuk, Servometer Corporation, March 26, 1987.

25. NJDEP, Division of Waste Management, Inspection Report on Servometer Corporation, October 31, 1988.

26. Quazza and Associates, Inc., Closure Observation of Servometer Corporation Underground Storage Tank, August 5, 1988.

27. U.S. EPA, General Information, EPA Form 3510-1(6-80), Servometer Corporation, EPA I.D. Number NJD002138543, October 31, 1980.

28. U.S. EPA, Hazardous Waste Permit Application, EPA Form 3510-3 (6-80), Servometer Corporation, EPA I.D. Number NJD002138543, October 27, 1980.

29. Letter from Stefan D. Sidlak, Section Chief, Metro Bureau of Regional Enforcement, NJDEP, to Peter Holowachuk, Servometer Corporation, November 18, 1988.

30. Telecon Note: Conversation between Greenskeeper, Glen Ridge Country Club, and S. Shulfer, NUS Corporation, June 30, 1988

31. Telecon Note: Conversation between R. Dickerson, Upper Montclair Country Club, and S. Shulfer, NUS Corporation, July 20, 1988.

REFERENCE NO. 1

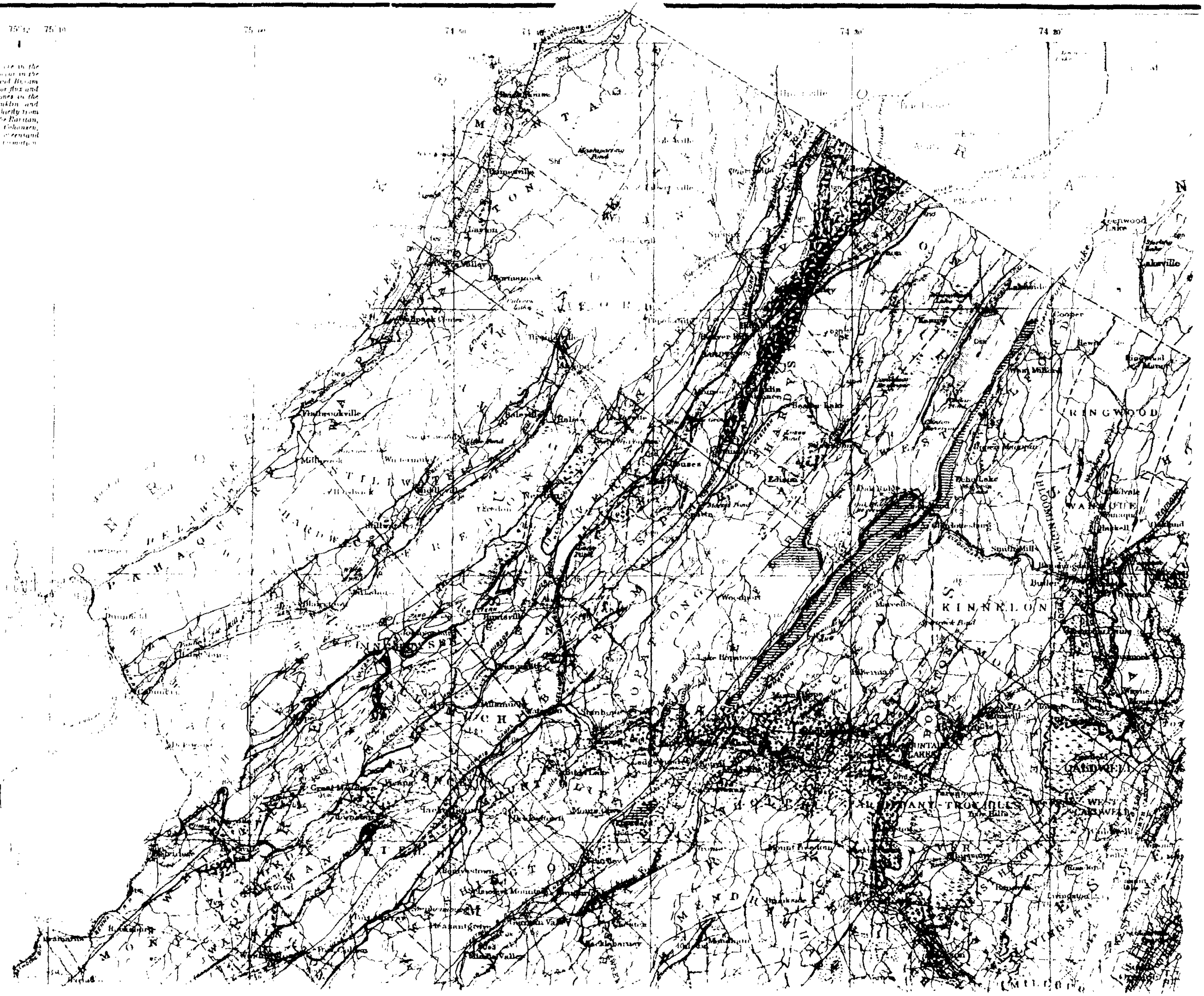
STATE OF NEW JERSEY

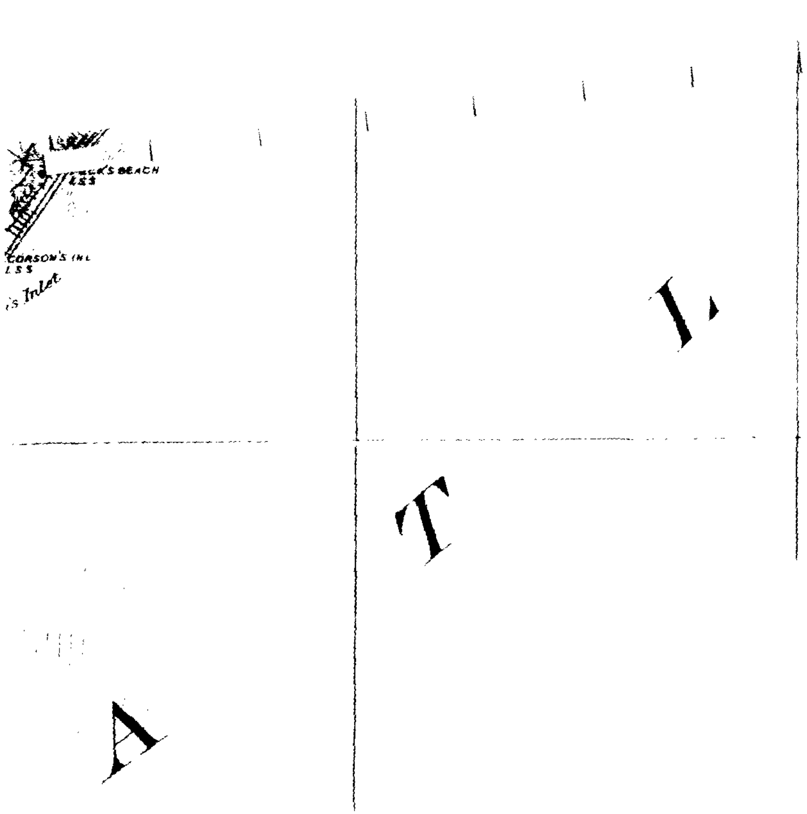
DEPARTMENT OF CONSERVATION AND ECONOMIC DEVELOPMENT

ATLAS SHEET No. 40

NOTE. Zinc [illegible] the Franklin [illegible], magnetic [illegible] in the Byram, Losee and Pochuck gneisses, [illegible] may occur in the Newark group; desirable building [illegible] obtained from the Losee and Byram gneisses, and [illegible] of the Newark group; limestone suitable for flux and lime from the Franklin, Kittatinny, Jacksonburg, and the limestones in the upper Delaware Valley; [illegible] cement manufacture from the Franklin and Jacksonburg limestones; crushed stone for road metal and concrete chiefly from the [illegible] of the Newark group; clay [illegible] the Raritan, [illegible], [illegible] and Cohansey, [illegible]

EOCENE





GEOLOGIC MAP
OF
NEW JERSEY

Compiled from published folios and from manuscript data in possession of the Survey, the latter chiefly the field work of

W. S. BAYLEY, (Pre-Cambrian)
H. B. KÜMMEL, (Paleozoic, Triassic, Quaternary)
R. D. SALISBURY, (Quaternary)
G. N. KNAPP, (Cretaceous, Tertiary, Quaternary)

BY

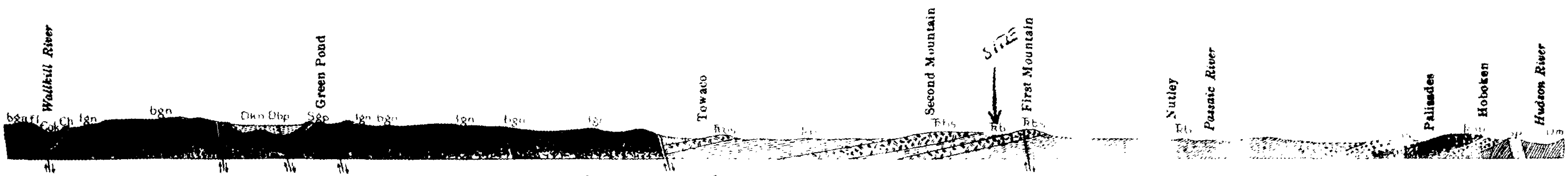
J. VOLNEY LEWIS AND HENRY B. KÜMMEL

1910-1912

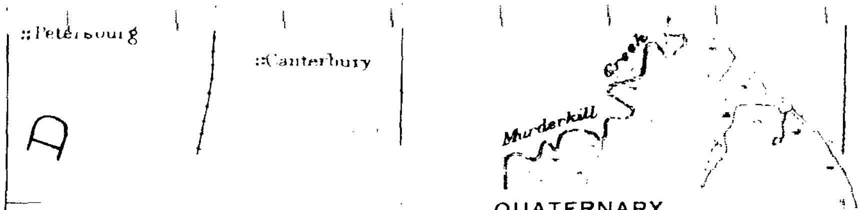
REVISED BY H. B. KÜMMEL, 1931
AND MEREDITH E. JOHNSON, 1950

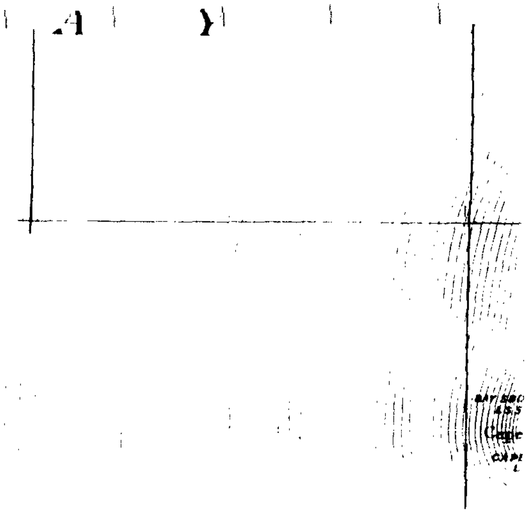
SCALE: 1:250,000 (approximately 4 miles to an inch)

4 3 2 1 0 4 8 12 Miles



Section A-A.—Dingman's Ferry to Hoboken. Scales: Horizontal, $\frac{1}{250000}$; Vertical, $\frac{1}{100000}$; Vertical exaggeration 2½.





QUATERNARY

Surface covering of variable thickness, generally unconsolidated.

GLACIAL

Note.—A sheet of stony or sandy clay of variable thickness (till, unstratified drift, or boulder clay) covers much of the surface north of the terminal moraine, but is not represented on the map.

Qtm — **Terminal Moraines of the last (Wisconsin) glacial epoch**
A belt of irregular hummocky accumulations of clay, sand, gravel, and boulders, in confused mixture.

Qrm — **Recessional Moraine (Wisconsin)**
Smaller moranic accumulations north of the terminal moraine, including some stratified drift of kame-like habit, and marking pauses in the recession of the last ice sheet.

Qsd — **Stratified Drift (Wisconsin)**
Sand and gravel plains, deltas, eskers, kames, and terraces, chiefly north of the terminal moraine and in the valleys leading south from it. Also includes sand, gravel, and clay deposits of the extinct Lake Passaic.

Shore Line of Lake Passaic (Wisconsin)
Broken line indicates approximate location.

Qed — **Early Drift**
Remnants of glacial drift, both stratified and unstratified, much older than the Wisconsin, south of the terminal moraine.

NONGLACIAL

Note.—Washed or wind-blown sand and gravel (unclassified and not shown on the map) cover the surface at many places in the Coastal Plain.

Qbs — **Beach Sand and Gravel**
Including dunes and dune sand along the coast. Not everywhere sharply distinguished from Cape May formation.

(UNCONFORMITY)

Qcm — **Cape May Formation (Sangamon epoch and later)**
Low terraces and plains of gravel and sand, with some clay. Merges into stratified drift in Delaware and Raritan valleys.

(UNCONFORMITY)

Qrd — **River Drift**
Higher terraces of the upper Raritan valley.

(UNCONFORMITY)

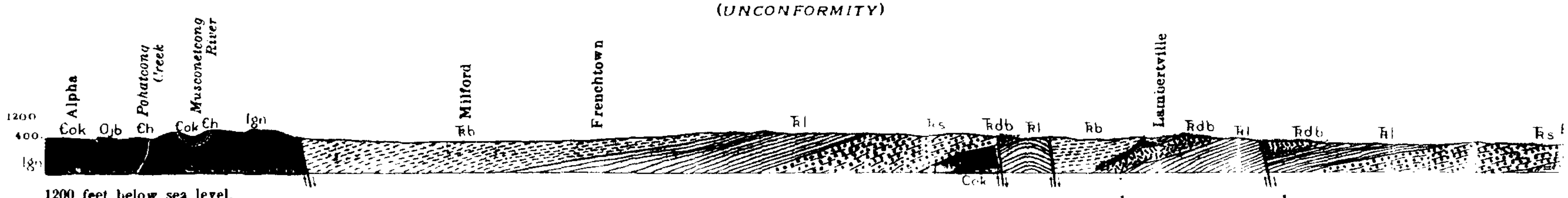
Qps — **Pensauken Formation (Interglacial and early glacial age)**
Gravel and sand on higher terraces, capping hills and divides, and covering some plains.

(UNCONFORMITY)

Qb — **Bridgeton Formation (Probably earliest glacial and interglacial age)**
Gravel and sand, in part solidified by iron oxide, capping higher hills and divides along the southeast side of the Amboy-Trenton and Delaware valleys.

(UNCONFORMITY)

38° 50′



Section C-C′.—Phillipsburg to Bordentown. Scales: Horizontal, $\frac{1}{250000}$; Vertical, $\frac{1}{100000}$; Vertical exaggeration 2

38° 40′ — 75°30′ — 75°20′ — 75°12′ — 75°10′ — 75°00′

Shark River Marl
Mixture of greensand (glauconite) and light colored earth, chiefly north of Asbury Park.

Manasquan Marl
Dark green glauconitic marl overlain by an ash-like mixture of fine quartz sand and grayish white clay.

Tvt **Vincentown Sand**
Glauconitic quartz sand alternating with beds of lime sand (coral fragments, etc.), the latter mostly consolidated.

Hornerstown Marl
Dark green glauconitic marl with varying amounts of quartz, fine earth, and clay. Marked shell bed at the top. South of Sykesville rests on Navesink marl below.

EOCENE

(UNCONFORMITY)

CRETACEOUS

Krb **Red Bank and Tinton Sands**
Coarse rusty sand, consolidated in places by iron oxide. In Monmouth County overlain by a bed of hard green clayey and sandy loam (Tinton).
The Red Bank is not found south of Sykesville, Burlington County.

Navesink Marl
Dark green glauconitic marl with shell bed at the base. South of Sykesville underlies the Hornerstown marl above.

Kmw **Mount Laurel and Wenonah Sands**
Coarse glauconitic sand (Mount Laurel) overlying fine micaceous sand (Wenonah).

Marshalltown Formation
Black sandy clay to clayey glauconitic marl.

Ket **Englishtown Sand**
White and yellow sand with little mica and glauconite and local thin layers of clay.

Kwb **Woodbury Clay**
Black to dove-colored clay, usually nonglauconitic.

Merchantville Clay
Black sandy clay, usually glauconitic.

Kmr **Magothy and Raritan Formations**
Dark lignitic sand and clay, containing some glauconite near the top (Magothy), overlying with slight unconformity variable sands and clays, chiefly light colored (Raritan).

(UNCONFORMITY)

TRIASSIC
(NEWARK GROUP)

Brunswick Formation
Soft red shale with sandstone beds, the latter more abundant toward the northeast; conglomerate beds (Trc) along northwestern border with quartzite or limestone pebbles in red matrix.

Lockatong Formation
Hard dark argillite with local thin beds of sandstone (flagstone); conglomerate beds (Trc) along northwestern border with quartzite or limestone pebbles in red matrix.

Stockton Formation
Gray feldspathic sandstone (arkose), conglomerate, and red shale; conglomerate beds (Trc) along northwestern border with quartzite or limestone pebbles in red matrix.

(UNCONFORMITY)

DEVONIAN

Skunnemunk Conglomerate
Coarse white quartz pebbles in purple-red matrix with frequent beds of red sandstone. (North central area).

Dbp **Bellvale Sandstone and Pequanac Shale**
Gray sandstone and sandy shale (Bellvale) overlying dark slaty shale (Pequanac). (North central area).

Dmo **Marcellus Shale and Onondaga Limestone**
Fissile black shale (in Delaware River below Port Jervis) overlying thin-bedded cherty limestone.

Dkn **Kanouse Sandstone**
Greenish sandstone above and light colored fine-grained conglomerate below (North central area).

Esopus Grit
Dark coarse sandstone with strong cleavage. (Northwestern area).

Dob **Oriskany and Becraft Limestones (including Port Ewen beds)**
Siliceous Oriskany limestone with sandstone coming in southward, separated from the gray cherty Becraft limestone below by a formation (presumably Port Ewen shale) which is everywhere concealed by heavy glacial drift. (Northwestern area).

New Scotland, Stormville and Coeymans Formations
Hard cherty limestone and limy shale (New Scotland) overlying light-gray limestone (Coeymans) and separated southward by a thin sandy bed (Stormville). (Northwestern area).

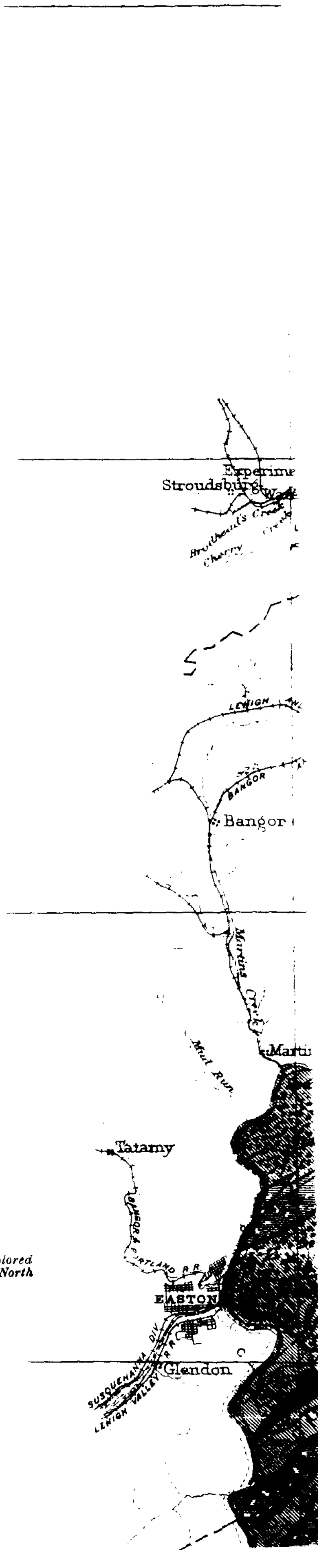
41° 10′

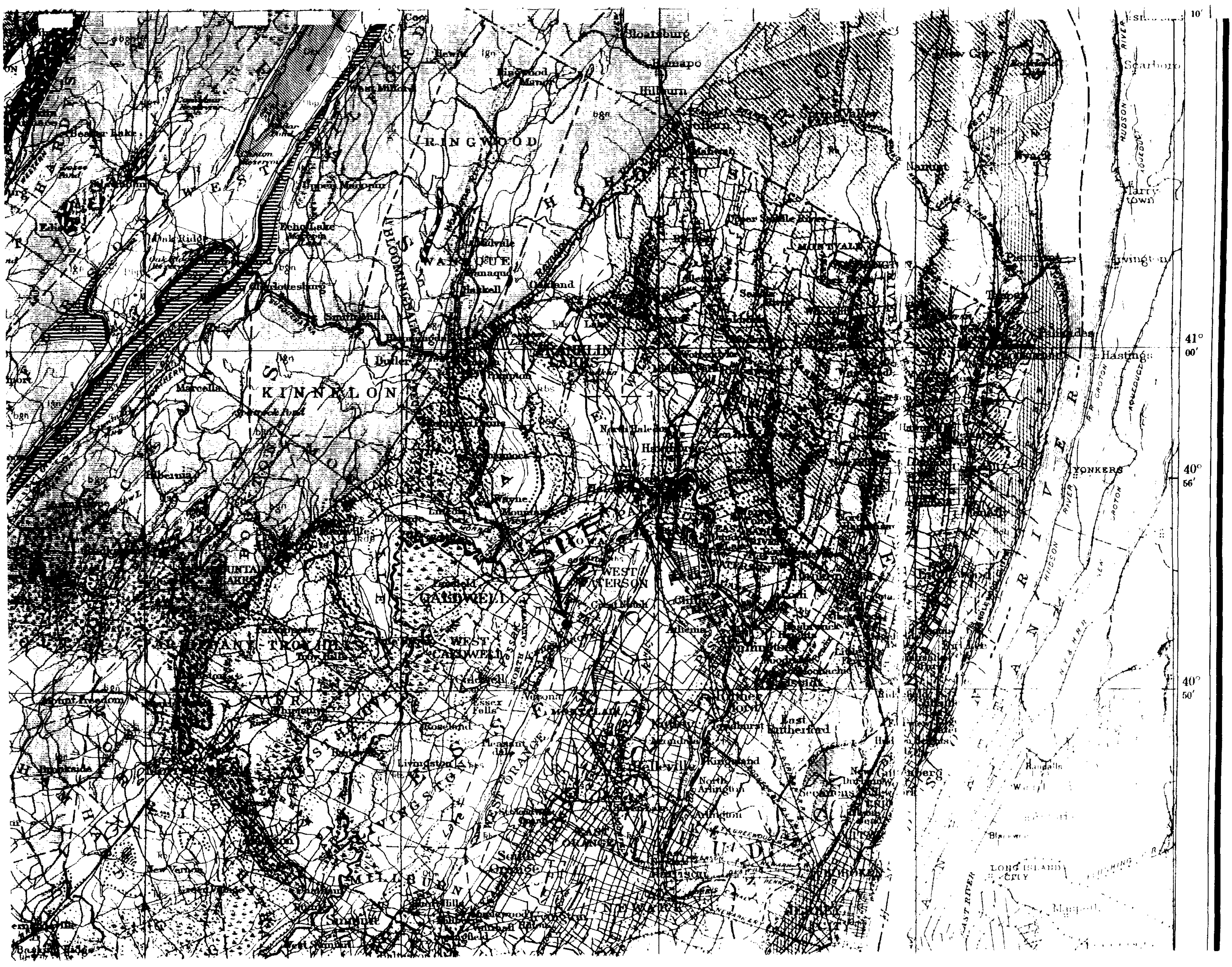
41° 00′

40° 56′

40° 50′

40° 40′




Sloatsburg
Ramapo
Hillburn
RINGWOOD
KINNELON
Marcella
Hibernia
Butler
Pompton
Oakland
Haskell
Wanaque
FRANKLIN LAKES
Upper Saddle River
Montvale
Nanuet
Nyack
Tarrytown
Irvington
Hastings
YONKERS
Scarboro
HUDSON RIVER
CROTON AQUEDUCT
Wayne
North Haledon
WEST PATERSON
CALDWELL
WEST CALDWELL
Essex Fells
Roseland
Livingston
Verona
Montclair
East Rutherford
Kingsland
North Arlington
Arlington
Secaucus
Englewood
Randalls
Blackwells
LONG ISLAND CITY
EAST RIVER
NEWARK
South Orange
Summit
Short Hills
Maplewood
Springfield
MILLBURN
Basking Ridge
Mount Freedom
Bernardsville
Echo Lake
Oak Ridge
Charlottesburg
Smith Mills
Upper Macopin
Beaver Lake
New Vernon
East Orange
East Newark
West Summit
Harrison
Kearny
Pleasant-dale
41°
00′
40°
56′
40°
50′
10′

REFERENCE NO. 2

GROUND-WATER RESOURCES OF ESSEX COUNTY, NEW JERSEY

By

William D. Nichols

Hydrologist, U. S. Geological Survey

SPECIAL REPORT NO. 28

1 9 6 8

Prepared by the U. S. Geological Survey

in Cooperation with the

State of New Jersey

GROUND-WATER RESOURCES OF ESSEX COUNTY, NEW JERSEY

By William D. Nichols

ABSTRACT

Ground water in Essex County occurs in joints and fractures in consolidated rocks and in the voids of unconsolidated statified drift deposits. Wells in sandstone and shale of the Brunswick Formation of Triassic age yield from 35 to 820 gpm; the most productive water-bearing zones are commonly between depths of 300 to 400 feet. Drawdown due to pumping is greatest in the direction of strike of the formation (about N 30′ E in Essex County) and least in the direction perpendicular to strike. Wells in the Watchung basalt, which is intercalated with rocks of the Brunswick Formation commonly yield small to moderate supplies but may occasionally yield up to 400 gpm. Large yields, ranging from 410 to 1,593 gpm, are common from wells tapping the stratified drift deposits in the western part of the county.

Quality of ground water is acceptable for most uses throughout the county. However, heavy pumpage in the Newark area has lowered water levels to more than 100 feet below sea level. The low water levels have reversed the natural gradient and induced the flow of salt water into the bedrock aquifer, seriously impairing ground-water quality there. Recent analyses of ground-water samples from Newark indicate that the chloride concentration in the aquifer has increased since the preliminary study of the problem by Herpers and Barksdale in 1951.

Highly productive stratified drift deposits are found primarily in that part of the county west of Second Watchung Mountain. They occur as valley-fill material in stream valleys cut into the underlying bedrock before the last glaciation. These deposits in Essex County are part of an extensive valley-fill aquifer system underlying the eastern Morris-western Essex County area. Water levels in these deposits in western Millburn Township have declined 36 feet since 1950, probably as a result of below normal rainfall for most of the period 1953 to 1966 together with constantly increasing pumpage throughout the area.

Withdrawals of ground water from all aquifers in Essex County for public supply averaged about 26 mgd (million gallons per day) in 1966. Pumpage for public supply from aquifers in unconsolidated sediments averaged 20.9 mgd, about 81 percent of the total from all aquifers.

Most of the productive aquifers in Essex County are currently being developed. Although the optimum potential of the stratified drift aquifers

in western Essex County and the Brunswick Formation in the northeastern part of the county probably has not been realized, development of these resources must be undertaken with care if anticipated increase in water needs of the county are to be met.

INTRODUCTION

PURPOSE AND SCOPE

This study was made as part of a statewide program of investigation of the ground-water resources of New Jersey, authorized by the New Jersey Water Supply Act of 1958 and its companion, Water Bond Act. The purpose and scope of these studies are to assemble the available data on geologic and hydrologic factors relating to the occurrence, movement, availability, and chemical quality of ground water in New Jersey; to evaluate and interpret the data; and to make the results of the investigation available to the public. This report represents the results of the ground-water investigation of Essex County made by the U. S. Geological Survey in cooperation with the New Jersey State Department of Conservation and Economic Development, Division of Water Policy and Supply. The work was under the general supervision of Allen Sinnott, formerly District Geologist.

LOCATION AND EXTENT OF AREA

Essex County is located in northeastern New Jersey between longitudes 74°05′W and 74°25′W, and latitudes 40°40′N and 40°55′N. It is bounded on the north by Passaic County; on the east by Bergen County, Hudson County, and Newark Bay; on the south by Union County and on the west by Morris County (fig. 1). The county is 127.44 square miles in area. Newark is the county seat. Other major communities include Orange, East Orange, South Orange, West Orange, Irvington, Belleville, Nutley, Montclair, and Bloomfield.

PREVIOUS INVESTIGATIONS

The geology of Essex County is described in detail by Darton and others (1908) in the Passaic folio. Salisbury (1894) discussed the surficial geology of the county as part of a regional investigation. Rogers and others (1951) described the engineering characteristics of the soils and glacial deposits in the county. Ground-water conditions in the extreme southwestern part of the county were described by Thompson (1932). Herpers and Barksdale (1951) discussed ground-water conditions in the Newark area.

ACKNOWLEDGMENTS

The author wishes to thank the numerous well drillers, State, municipal, and industrial officials and private individuals who supplied data on which this report is based. Acknowledgment is made for the records and logs of wells that were furnished from the files of the New Jersey Bureau of Geology and Topography. The cooperation of those who permitted use of their wells for water-level observation, collection of water samples, and pumping tests is gratefully acknowledged. Most of the well inventory for this report was made by the late O. J. Coskery of the U. S. Geological Survey.

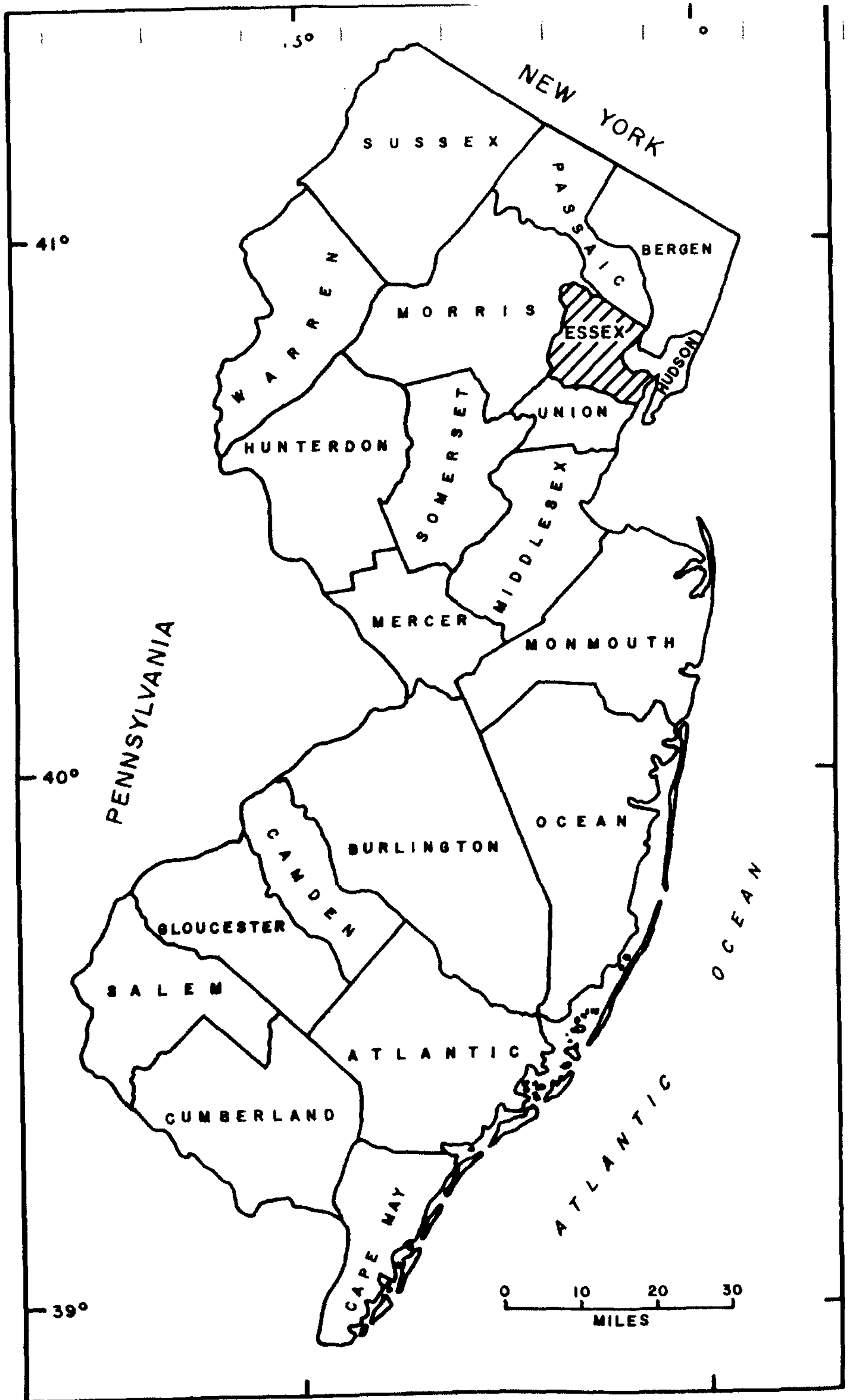


Figure 1.—Map of New Jersey showing the location of Essex County.

GEOGRAPHY

TOPOGRAPHY

Essex County is situated entirely on the Triassic lowlands of the Piedmont Province, one of six physiographic provinces included in the Appalachian Highland physiographic division. The province consists primarily of lowland and gently rolling hills above which rise the ridges of the Watchung Mountains. Altitudes in Essex County range from sea level in the southeastern part of the county to 650 feet along the ridges of the Watchung Mountains. The escarpment of the First Watchung Mountain, trending from northeast to southwest across the middle part of the county, rises 400 feet above the gently rolling plain to the east; the breadth of the First and Second Watchung Mountains varies from 1 to 2 miles. The major streams draining Essex county are the Passaic, Rahway, and Elizabeth Rivers.

CLIMATE

The climate of Essex County, like that of much of New Jersey, is mainly continental because of the predominance of winds from the continental interior. The prevailing wind is from the northwest from October to April and from the southwest for the remaining months. As a consequence, winter weather is controlled by cold continental air masses and summer by tropical air masses. Precipitation in the county averages more than 48 inches annually, and is commonly well distributed throughout the year. Part of the precipitation is received from storms which cross the Great Lakes region and pass down the St. Lawrence Valley. However, the heaviest general rains are produced by coastal storms of tropical origin. The centers of these storms usually pass some distance offshore, with rainfall heaviest and winds strongest near their center (U. S. Department of Agriculture, page 1010, 1941). The average January temperature for the eastern part of the county is 39°F and that of the western part of the county about 28°F. Average temperatures in July range from about 74°F in the eastern part of the county to about 72°F in the western part of the county.

POPULATION AND ECONOMY

Compared with the other counties in New Jersey, Essex County ranks only nineteenth in area, but ranks first in population as of the 1960 census. The population increased from 905,949 in 1950 to 923,545 in 1960—an increase of 1.9 percent; less than in any preceding 10 year period since 1900, except for 1930-40.

Population of Essex County 1900-60

1900	359,053
1910	512,886
1920	652,089
1930	833,513
1940	837,340
1950	905,949
1960	923,545

Nearly 90 percent of the county's population is located in the 71.5 square miles (55.6 percent of total area) east of the Watchung Mountains.

The economy of Essex County is primarily industrial. The principal manufactured products include food products, electrical goods and machinery, chemicals, machinery (excluding electrical machinery), fabricated metal products, and apparel. In 1960, only about 5 percent of the total land area of the county was utilized as farmland.

GEOLOGY

INTRODUCTION

The Brunswick Formation and Watchung Basalt of the Newark Group of Late Triassic age underlie all of Essex County. The Brunswick Formation is dominantly shale and sandstone, but also includes minor amounts of conglomerate. The Watchung Basalt consists of three extensive sequences of lava flows intercalated with the shale and sandstone of the Brunswick Formation. The generalized bedrock geologic map (fig. 2) shows the areal extent of the rocks of Triassic age underlying Essex County. Overlying the rocks of the Newark Group are unconsolidated clay, sand, and gravel deposited during the Pleistocene and Recent Epochs. Pleistocene deposits are the most widespread and are found throughout the county. Deposits of Recent age are confined to the present-day stream valleys. Figure 3 shows the general distribution of the unconsolidated Pleistocene deposits.

Parts of Fairfield and Millburn Townships and Newark are underlain by valleys cut (fig. 3) in bedrock by streams that drained the area before the last glaciation. The valley were subsequently filled in and buried by glacial debris and have little present-day surface expression.

DISTRIBUTION AND LITHOLOGY OF ROCK UNITS

Consolidated Rocks

Rocks of the Brunswick Formation, the uppermost unit of the Newark Group, underlie most of Essex County. The formation consists dominantly of interbedded brown, reddish-brown, and gray shale, sandy shale, sandstone, and some conglomerate. Three sheets of gray to black basalt are intercalated with sandstone and shale beds of the Brunswick Formation. The total thickness of the Brunswick Formation is not known, but probably exceeds 6,000 feet (Kümmel 1940, p. 102).

In the southern part of the county east of the Watchung Mountains, the Brunswick Formation is predominantly a soft red shale. These rocks become coarser grained toward the north. In the northern part of the county the rocks are mostly sandstone and some interbedded shale; conglomerate is found in the extreme northern part of the county. This change from soft, easily weathered, shale to more resistant sandstone is reflected in the change of topography from the rather flat low-lying plain with few hills in southern Newark to hills of low relief in the northern part of the county.

Between First and Second Watchung Mountains, the Brunswick Formation is dominantly sandstone. West of Second Watchung Mountain, the formation is covered with thick deposits of unconsolidated sediments of glacial origin and few outcrops can be found. As indicated from records of wells drilled in this area, the rocks are mainly shale and some interbedded sandstone.

Two prominent ridges, First and Second Watchung Mountains, extend from northeast to southwest across the county (fig. 2). These are the two lowest sequences of basalt flows of the Watchung Basalt. The third, uppermost, sequence of flows is represented by Ricker Hill in Livingston Township. These basalt sheets were formed by lava which was extruded at three different times during the accumulation of the sedimentary rocks of the formation. Each of these sheets is made up of several lava flows. Scoriaceous zones occur at the top of many of the individual flows. In some places, thin beds of shale occur between successive flows. The lower part of the Watchung Basalt, which comprises First Watchung Mountain, is from 600 to 650 feet thick; the Watchung Basalt in Second Watchung Mountain varies from 750 to 900 feet in thickness; the uppermost Watchung Basalt ranges from 225 to 350 feet in thickness (Darton and others, 1908, p. 10).

First and Second Watchung Mountains are parallel, and in places have double-crested ridges reflecting the presence of interbedded sedimentary rocks; the ridges generally rise between 300 and 400 feet above the adjacent country. The trend of the ridges reflect the general strike of the sedimentary rocks of the Brunswick Formation. The beds dip about 10 degrees toward the northwest.

Pleistocene and Recent Deposits

Unconsolidated sediments deposited by glaciers or by glacial meltwater during the Pleistocene Epoch cover most areas of Essex County. These deposits can be divided roughly into several types. Unstratified drift called till or ground moraine is a heterogeneous mixture of clay, silt, sand, gravel, cobbles, and boulders which was deposited by the ice. Unstratified drift that has accumulated in a ridgelike deposit along the margin of a glacier is called an end moraine. Stratified drift is deposited by glacial meltwater in streams (glaciofluvial deposits) and lakes (glaciolacustrine deposits). Glaciofluvial deposits are generally stratified sand, and sand and gravel, and glaciolacustrine deposits are usually bedded or laminated silt and clay. Figure 3 is a map showing the generalized distribution of the Pleistocene deposits in Essex County.

Streams and rivers draining the Essex County area before the last glaciation cut deep valleys into the Triassic rocks (fig. 3). These valleys were subsequently buried by glacial debris, and the thickness of the glacial deposits is largely controlled by the underlying bedrock topography. The

altitude of the floor of the buried bedrock valley under the Newark area is as much as 280 feet below sea level (fig. 4), and the glacial drift is as much as 300 feet thick. In the southwestern corner of Essex County in Millburn Township, the altitude of the valley floor is 17 feet above sea level and the drift averages 150 feet in thickness. In the northwestern part of the county in Fairfield Township, the floor of the valley is as much as 35 feet below sea level and the drift has a maximum thickness of about 200 feet. In the areas between the valleys, where the bedrock surface is high, the drift ranges from 0 to 70 feet thick.

East of the Watchung Mountains and west of the buried valley under the Newark area, the glacial deposits consist dominantly of till. The valley under the Newark area, however, is filled largely with stratified drift and interbedded lenses of till. In the central and southern part of Newark the main valley (fig. 4) is filled with as much as 200 feet of lacustrine clay and sandy clay, which is overlain by 50 to 100 feet of other stratified or unstratified glacial drift. In the northern part of Newark, where the valley (fig. 4) parallels the Passaic River, the valley contains several deposits of sand and gravel interbedded with clay and till. The sand and gravel ranges from 1 to 19 feet in thickness and is encountered mostly at depths of less than 50 feet and depths of more than 220 feet below land surface.

The present-day valley between First and Second Watchung Mountains is underlain by approximately 100 feet of stratified drift in both Cedar Grove in the north and Millburn Township in the south. These deposits consist mostly of stratified sand and gravel. Their maximum thickness appears to occur under that part of the valley west of the Rahway and Peckman Rivers; east of the rivers, the bedrock surface is shallow (30 to 50 feet below the valley floor), and the unconsolidated deposits are thin. There are not enough data to define the thickness and character of the subsurface glacial deposits in the valley in Verona and most of West Orange.

28
32
60
6
66

West of Second Watchung Mountain, the stratigraphy of the glacial deposits is moderately complex, especially in the buried valleys. The drift in the main buried valley in Livingston and Millburn Townships (fig. 3) has a maximum thickness of about 170 feet and consists of interbedded sand, sand and gravel, clay and till. Thicknesses of sand and gravel outwash range from 20 to 80 feet. Farther north, in north-western Fairfield, the main buried valley (fig. 3) is filled with as much as 200 feet of drift consisting almost exclusively of 140 to 170 feet of laminated silt and clay underlain by 10 to 30 feet of till. Deposits of fine- to medium-grained sand ranging in thickness from 0 to 20 feet occur on the surface

The tributary buried valleys in Fairfield Township (fig. 3) contain from 30 to 50 feet of silty sand, sand, and gravel overlain by clay and till near the confluence with the main buried valley. Where the bedrock surface is high, between buried valleys, the glacial deposits consist dominantly of till. However, some stratified sand and gravel are found in the subsurface in eastern Roseland and Essex Fells which do not occur as valley-fill deposits.

Unconsolidated sediments of Recent age are confined to areas adjacent to present-day streams. These deposits consist of clay, silt, and fine sand with gravel. (Rogers and others, 1957, p. 7).

GROUND-WATER HYDROLOGY

INTRODUCTION

Ground water is derived from that part of precipitation that does not run off the surface of the land to streams or return to the atmosphere through evaporation and transpiration. Factors which determine the amount of water that infiltrates to the ground-water reservoir include (1) the porosity and permeability of the surficial material, (2) the slope of the land, (3) the amount and kind of natural and artificial cover, and (4) the intensity and amount of precipitation.

The permeability of a rock, or its ability to transmit water, depends on its porosity, that is, on the number and size of the interstices and on the extent to which the interstices are interconnected. The porosity of a rock, in turn, depends largely on: "the shape and arrangement of its constituent particles, the degree of assortment of its particles, the cementation and compacting to which it has been subjected since its deposition, the removal of mineral matter through solution by percolating waters, and the fracturing of the rock, resulting in joints and other openings" (Meinzer, 1923, p. 3). Porosity is expressed quantitatively as the ratio between the volume of void to the total volume of the rock, that is, as the percentage of the total volume of rock occupied by interstices.

On the basis of the type of openings in which ground water may occur, the geologic formations in Essex County may be divided into two groups: (1) consolidated rocks of Triassic age, and (2) unconsolidated sediments of Pleistocene age.

The primary pore spaces in consolidated rocks of the Brunswick Formation in Essex County are commonly so small that an insignificant quantity of water, if any, moves through them under the natural hydraulic gradients or those established by pumping. However, a joint and fracture system that has developed in the consolidated rocks provides secondary porosity and it is largely in and through these openings that the storage and movement of ground water takes place. In addition, vesicles and scoriaceous zones in the basalt add to the porosity in these rocks. Limited interconnected void space occurs in sandstone beds where cementing material is lacking. The volume of all of these openings constitute only a very small percentage of the total volume of the Brunswick Formation and, consequently, their capacity to store and transmit water is limited.

In unconsolidated sediments, water occurs in the pore spaces between the constituent grains. The capacity of unconsolidated sand and gravel deposits to store and transmit water is commonly much greater than that of the consolidated rocks. The reason for this is that the ratio of the volume of void to the total volume of unconsolidated sediment is considerably greater than the ratio of the volume of fracture openings to the total volume of rock. The interstitial openings in clays and silts are so small, however, that they restrict the movement of water, even though the percentage of void space may be great.

WATER-BEARING PROPERTIES OF MAJOR GEOLOGIC UNITS

Consolidated Rocks

Rocks of the Brunswick Formation are the main source of ground water in Essex County. The shales and sandstones are generally capable of sustaining moderate to large yields to wells. The Watchung basalt commonly is capable of yielding only small to moderate quantities of water.

Water in these rocks occurs under both unconfined and confined conditions. Unconfined ground water occurs mainly in the upland areas where overlying unconsolidated deposits are thin or absent. Confined and semiconfined ground water conditions exist in lowland areas in Newark, parts of Fairfield, and along the Passaic River where clay beds in the unconsolidated Quaternary deposits mantle the underlying rocks. Wherever such confinement occurs, water beneath the relatively impermeable confining layers is commonly under artesian pressure. In many areas, such as parts of Fairfield and in the northern part of the county, water in wells tapping the confined aquifers will rise above the top of the aquifer and sometimes near or above land surface. In areas subjected to heavy pumping, such as the Newark area and western Millburn Township, the artesian pressure may be considerably reduced. Parts of the confined aquifer may even become dewatered as has happened in part of Newark, in which case the water remaining in the aquifer is no longer confined.

Confined ground water is also encountered in the shales and sandstone directly beneath the basalt flows in the western part of the county downdip from the outcrop area. Confined or semiconfined ground-water conditions may occur in some areas because of differences in permeability within the rock layers resulting from variations in fracturing or weathering or a combination of both.

Some of the various systems of joints and fractures in the consolidated rocks intersect so that water can move vertically as well as horizontally and zones of high secondary porosity are then interconnected. Most wells tapping these rocks draw water from more than one water-bearing zone. However, these zones in the Brunswick Formation have not yet been accurately defined. They are certainly within the first 600 feet below land surface, and for most practical purposes are probably within the first 400 feet. The best producing wells in the Brunswick Formation in

Essex County are for the most part between 300 and 400 feet deep. Nevertheless, the lack of any precise known boundaries makes it difficult to determine the optimum depth to which a well should be drilled in any given location. Also it is impossible to predict the yield of a proposed well except in very general terms based on the average yield of other wells in the area.

Two pumping tests, both at the same locality, were conducted by the U. S. Geological Survey in January 1949 on wells tapping the Brunswick Formation in Essex County. The wells (owned by P. Ballantine and Sons, Newark), shown on figure 5, were selected to provide the best possible spread of observation wells in as many directions as possible. As the results of the tests have been reported by Herpers and Barksdale (1951, p. 28-31) they will be only summarized here.

In the first test, the centrally located well I-1 was pumped and water levels were observed in the seven surrounding wells indicated on figure 5. Well II-9 was pumped during the second test and the same wells were used to observe water levels. In both tests, observation wells lying along the strike of the Brunswick Formation with respect to the pumping well showed the greatest drawdown. When well I-1 was pumped, there was a prompt and distinct decline of the water level in observation well II-8. When well II-9 was pumped, the water level in observation well II-10 responded promptly and distinctly. No significant response was seen in observation wells aligned in directions other than along the strike during either test.

In these tests, as well as in several others conducted, it is invariably noted that aquifers in the sedimentary rocks of Triassic age of northern New Jersey are anisotropic, that is, they do not transmit water equally in all directions (Vecchioli, 1967). The greatest drawdowns are observed in those wells aligned along the strike of the sedimentary layers with respect to the pumping well. The least amount of drawdown is observed in observation wells that are located transverse to the strike. These observations have been interpreted to indicate that water moves more readily along joints and fractures which strike parallel to the strike of the bedding than along joints and fractures which strike in other directions. It is useful, when planning future well locations, to know the direction in which wells will interfere most with each other and with existing wells. In general, wells should be spaced far apart along the direction of strike (approximately N 30° E for most of Essex County) because it is in this direction that the greatest interference occurs. They may be placed closer together perpendicular to the strike since interference is less in ...

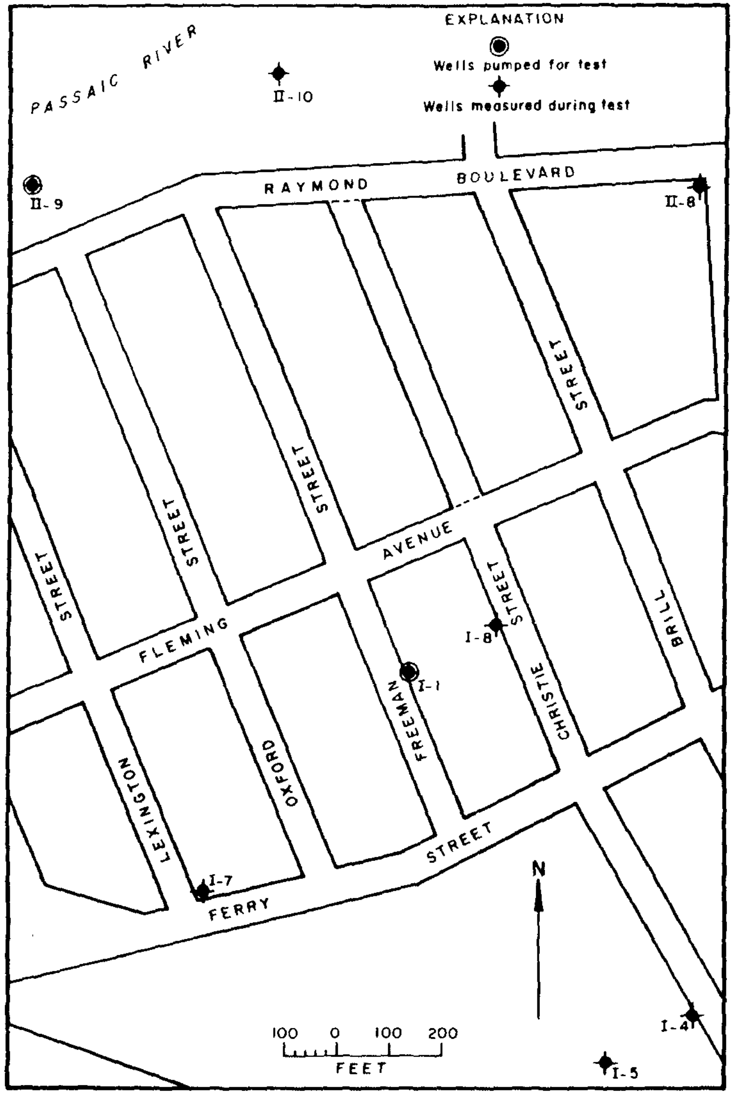


Figure 5.—Location of wells at plants of P. Ballantine and Sons, Newark, N. J., used during pumping tests in January 1949 (after Herpers and Barksdale, 1951, fig. 3, p. 30).

Well Yield and Specific Capacity

Yields of 35 large diameter public-supply, industrial, and commercial wells tapping the Brunswick Formation range from 35 to 820 gpm (gallons per minute) (Table 2) and average 364 gpm. The distribution of the yields is as follows:

Yields	*No. of wells*
0-150	4
151-300	12
301-500	12
>500	7

Depths of the same wells in the Brunswick Formation range from 115 to 856 feet; the average depth is 381 feet. Specific capacities of the 35 wells range from 0.21 to 70.00 gpm per foot of drawdown and average 11.07 gpm per foot of drawdown.

Wells tapping the Watchung Basalt commonly produce small to moderate quantities of water. Yields of 26 wells range from 7 to 400 gpm (Table 2) and average 116 gpm. The distribution of the yields is as follows:

Yields	*No. of wells*
0-100	15
100-199	5
200-300	5
>300	1

Specific capacities of wells in the basalt range from 0.05 to 5.66 gpm per foot of drawdown and average 1.74 gpm per foot of drawdown. Several moderate to high yielding public supply and industrial wells have been developed in the Essex Fells-West Caldwell-Fairfield area. These higher yields may be the result of increased fracturing of the basalt which has been slightly folded in this area.

Figures 6, 7, and 8 are specific capacity cumulative frequency distribution graphs for wells in the Brunswick Formation in Essex County. In figure 6, specific capacities are grouped on the basis of well depth. Wells drilled between 300 and 399 feet deep appear to have consistently higher specific capacities than wells of other depths (fig. 6). This relationship suggests that the best water-bearing zones in the Brunswick Formation will be

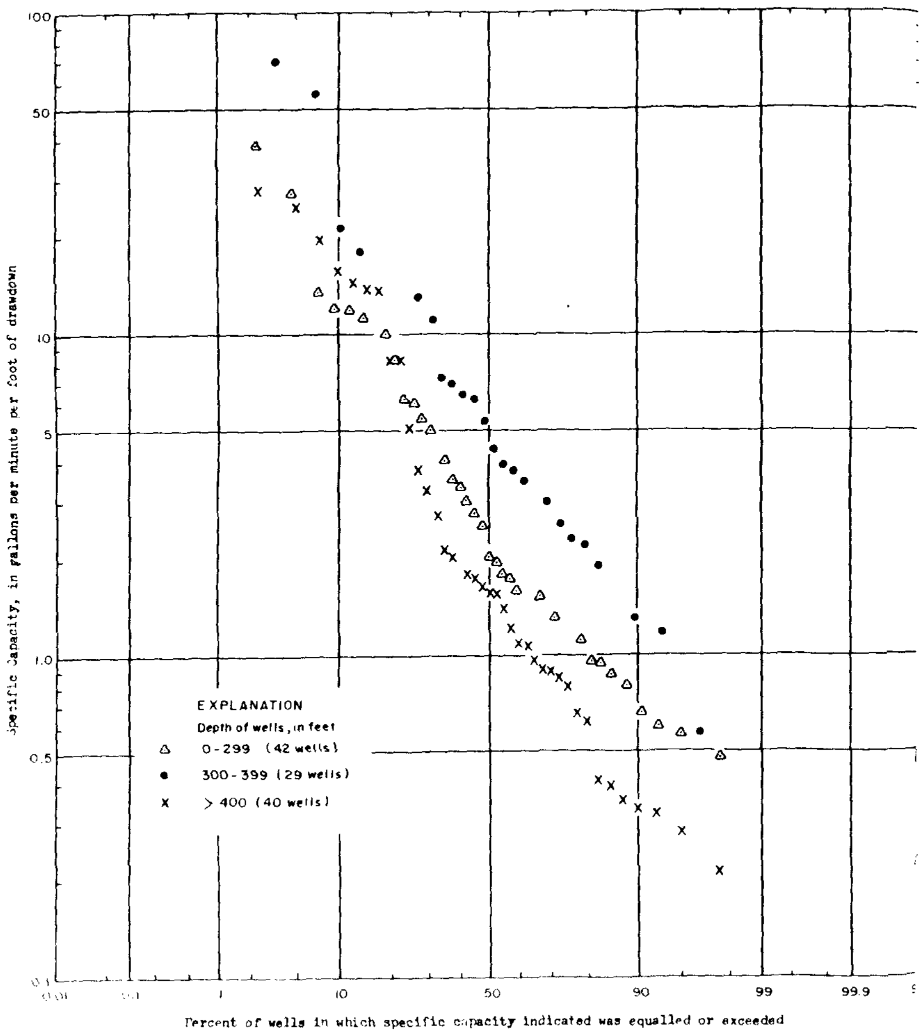


Figure 6.—Cumulative frequency distribution of specific capacities of wells penetrating the Brunswick Formation grouped according to depth.

encountered between depths of 300 and 400 feet and that significantly greater quantities of water generally will not be obtained by drilling below 400 feet. The specific capacities of wells grouped according to geographic area are shown in figure 7. These areas divide Essex County into three strips which are approximately parallel to the strike of the Brunswick Formation. The eastern strip is further divided into a northern part covering Belleville, Bloomfield, Glen Ridge, and Nutley, and a southern part covering East Orange, Irvington, and Newark. From this graph it readily can be seen that wells in Maplewood, Montclair, Orange, South Orange, and West Orange, have generally higher specific capacities than wells in other parts of Essex County. The wells in these communities are located in the area immediately east of First Watchung Mountain. In figure 8, specific capacities are related to well diameter. As should be expected, larger diameter wells have higher specific capacities.

Quality of Water

Except for hardness-forming constituents and local salt-water contamination, water from the Triassic rocks commonly does not contain objectional concentrations of any chemical constituents throughout most of the county (Table 3). The hardness of water ranges from 104 ppm (parts per million) to 273 ppm. In the Newark area, salt-water contamination has seriously impaired the quality of ground water and chloride concentration are as high as 1,900 ppm.

Ground water has high chloride concentrations in areas of relatively heavy pumpage in eastern Newark adjacent to Newark Bay and the Passaic River. By 1900, water levels in these areas, notably in the southeastern section, were considerably below sea level (fig. 9). The major pattern of ground-water development had changed slightly by 1960. More significant however is the extent to which water levels had been lowered below sea level and the incerase in the size of the area affected by 1960 (fig. 10). Heavy ground-water withdrawals have lowered the general water level in these areas (fig. 10), reversing the natural gradient between the ground- and surface-water bodies, and have induced a flow of salt water from the river and bay into the underlying water-bearing formations A water sample collected in 1879 from a well owned by the Celluloid Works, located in this part of Newark, contained only 6.2 ppm chloride. In 1948, water with 1,900 ppm chloride was collected from a well in the same area owned by P. Ballantine and Sons. A probable contributing factor in salt-water intrusion is the dredging of ship canals in Newark Bay and the Passaic River. In deepening these canals, semi-pervious Recent and Pleistocene sediments were removed which had acted as an imperfect barrier to the infiltration of salt

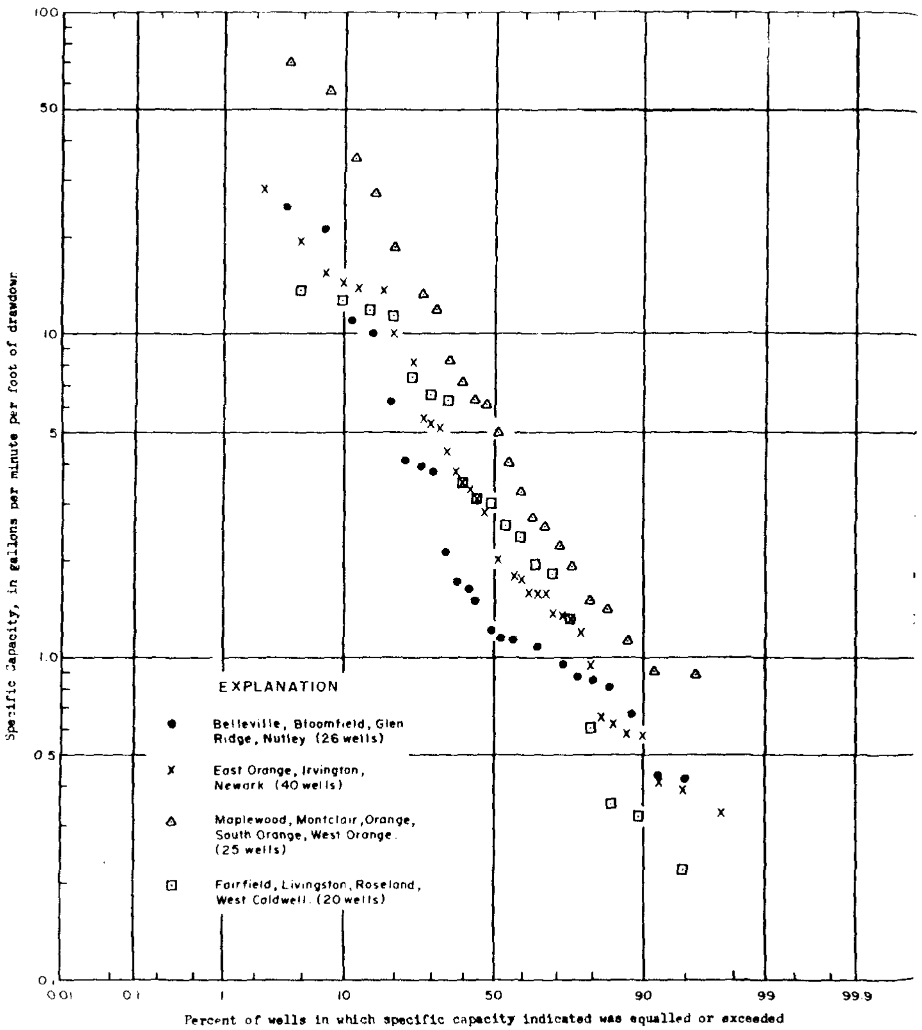


Figure 7.—Cumulative frequency distribution of specific capacities of wells penetrating the Brunswick Formation grouped according to geographic area.

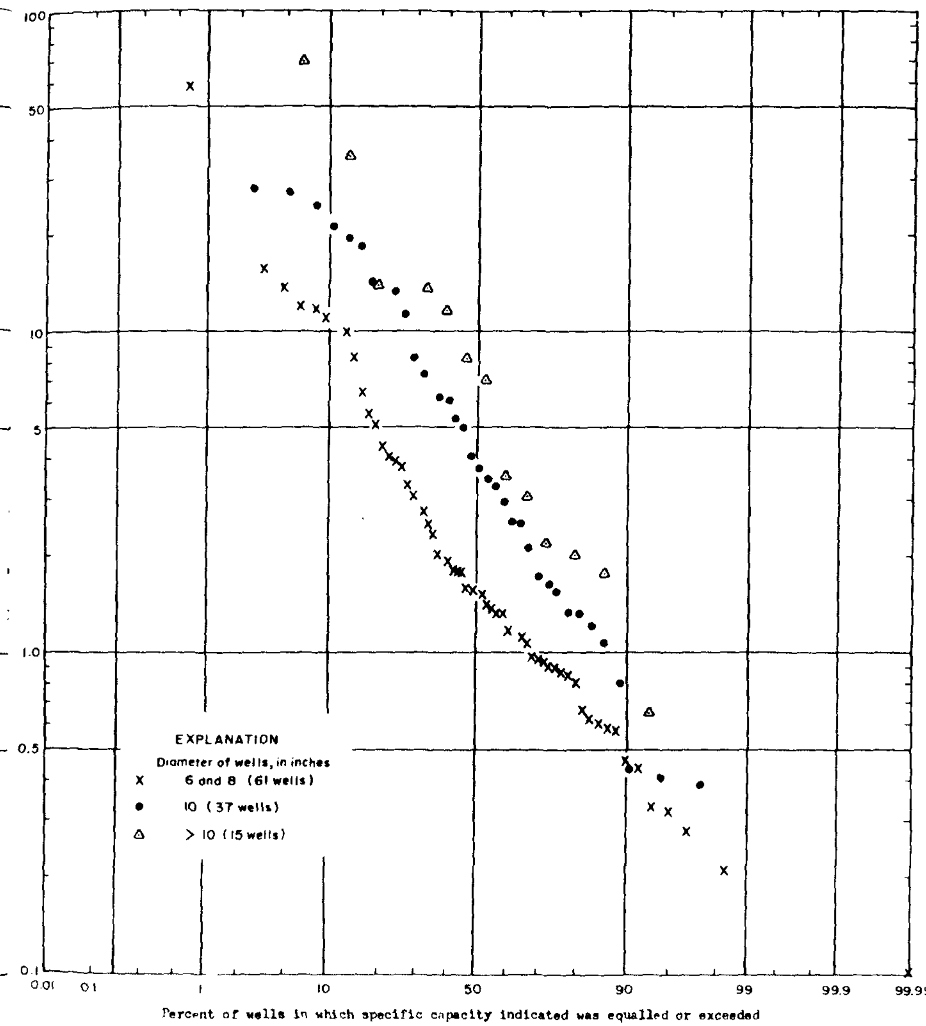


Figure 8.—Cumulative frequency distribution of specific capacities of wells penetrating the Brunswick Formation grouped according to well diameter

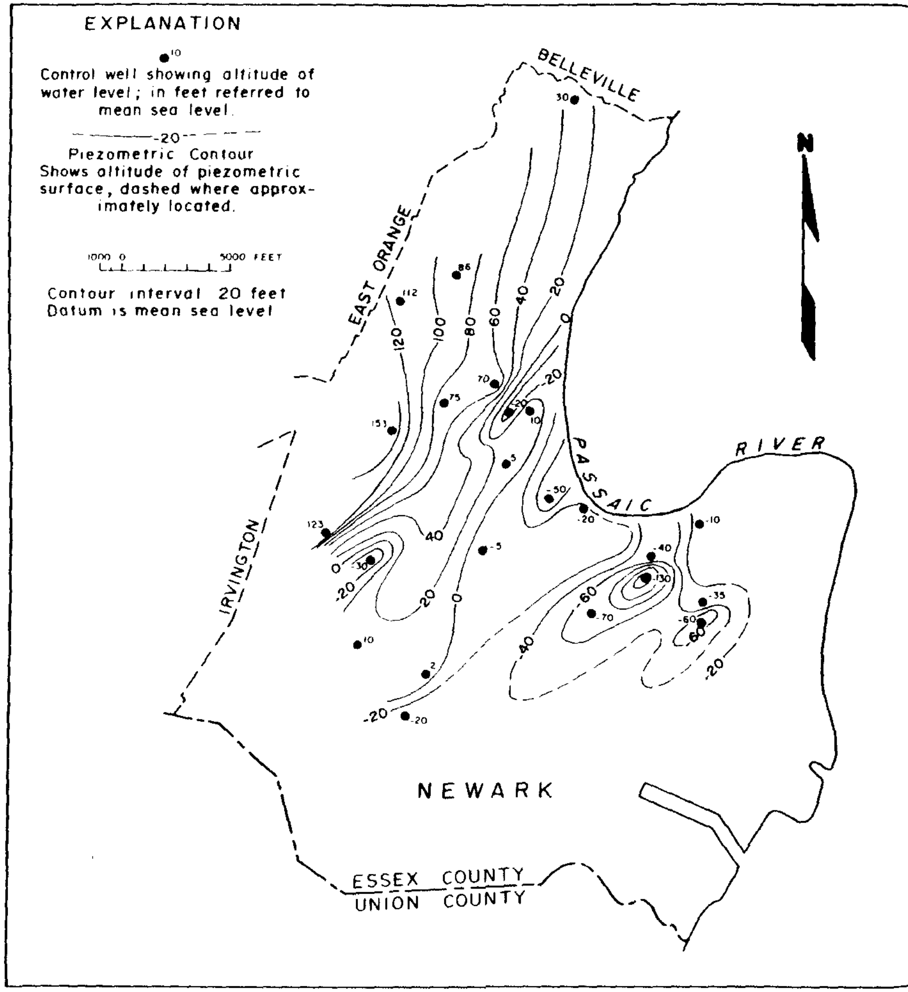


Figure 9.—Generalized piezometric contours for the Brunswick Formation in the Newark area based on water levels in wells drilled between 1890 and 1900.

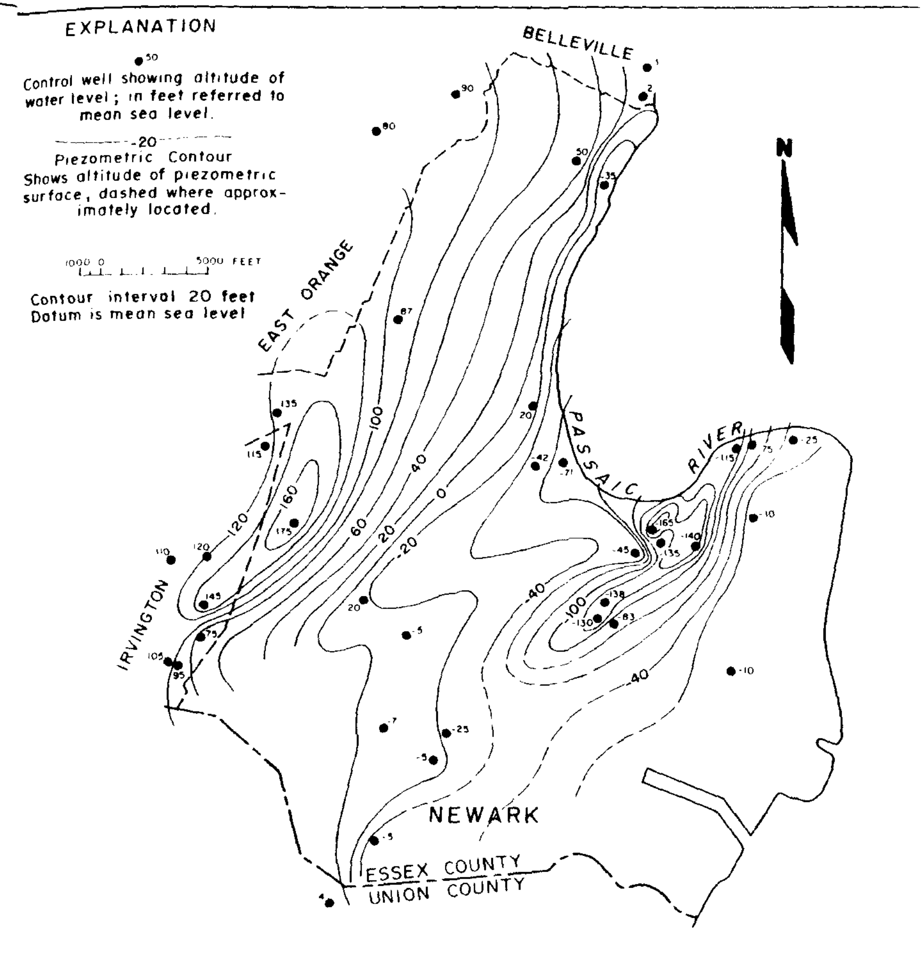


Figure 10.—Generalized piezometric contours for the Brunswick Formation in the Newark area based on water levels in wells drilled between 1950 and 1960.

Salt-water contamination of the Brunswick Formation in the Newark area has been investigated by Herpers and Barksdale (1951). Their study was based on analyses of water samples collected in 1942 by the city of Newark. More recent analyses suggest there has been additional encroachment of saline water since 1942 throughout the problem area. In 1942, water from the Wilbur Driver Company's well No. 2 along the Passaic River in northern Newark contained 72 ppm chloride. In 1961, water from this same well contained 330 ppm chloride. Water from a well drilled by Mutual Benefit Life Insurance Company, 520 Broad Street, in 1965 contained 1,145 ppm chloride. Samples collected from other wells in this area contained less than 500 ppm chloride in 1942.

Pleistocene Deposits

Unconsolidated sediments of Pleistocene age mantle the bedrock throughout much of Essex County (fig. 3). They consist of clay, silt, sand, gravel, and boulders and can be divided into two general categories—stratified drift and unstratified drift. Only sand and gravel aquifers in stratified drift deposits contain sufficient quantities of water to warrant discussion of their water-bearing properties.

Water in the stratified drift occurs under both unconfined (water table) and confined (artesian) conditions. Unconfined ground water occurs where sand and gravel deposits are not covered by clay, silt, or glacial till and are exposed at the surface. The distribution of these deposits is shown on figure 3. For the most part however, these sand and gravel deposits do not yield large quantities of water as they are commonly less than 20 feet thick and are not areally extensive. The unconfined aquifers are recharged directly from precipitation on the outcrop area. Confined and semiconfined ground water occurs where sand and gravel deposits have been covered by lake clay or silt, or by glacial till. These deposits are largely confined to the buried valley so they are not visible on the surface and their regional extent and distribution are therefore not readily apparent. The confined and semiconfined aquifers are recharged by leakage through overlying confining beds and by precipitation falling on outcrop areas outside Essex County. Some recharge may also be derived from the underlying and adjacent Brunswick Formation.

The most productive artesian and semi-artesian aquifers in the stratified drift in Essex County occur as valley fill in stream valleys that were cut in the bedrock before the last glaciation. Consequently the size, shape, and distribution of the aquifers conform to the size, shape, and distribution of the bedrock valleys. The bedrock valley underlying the Newark area (shown on fig. 4) is filled with till and clay, and contains only minor amounts of water-bearing sand. Extensive subsurface exploration in western

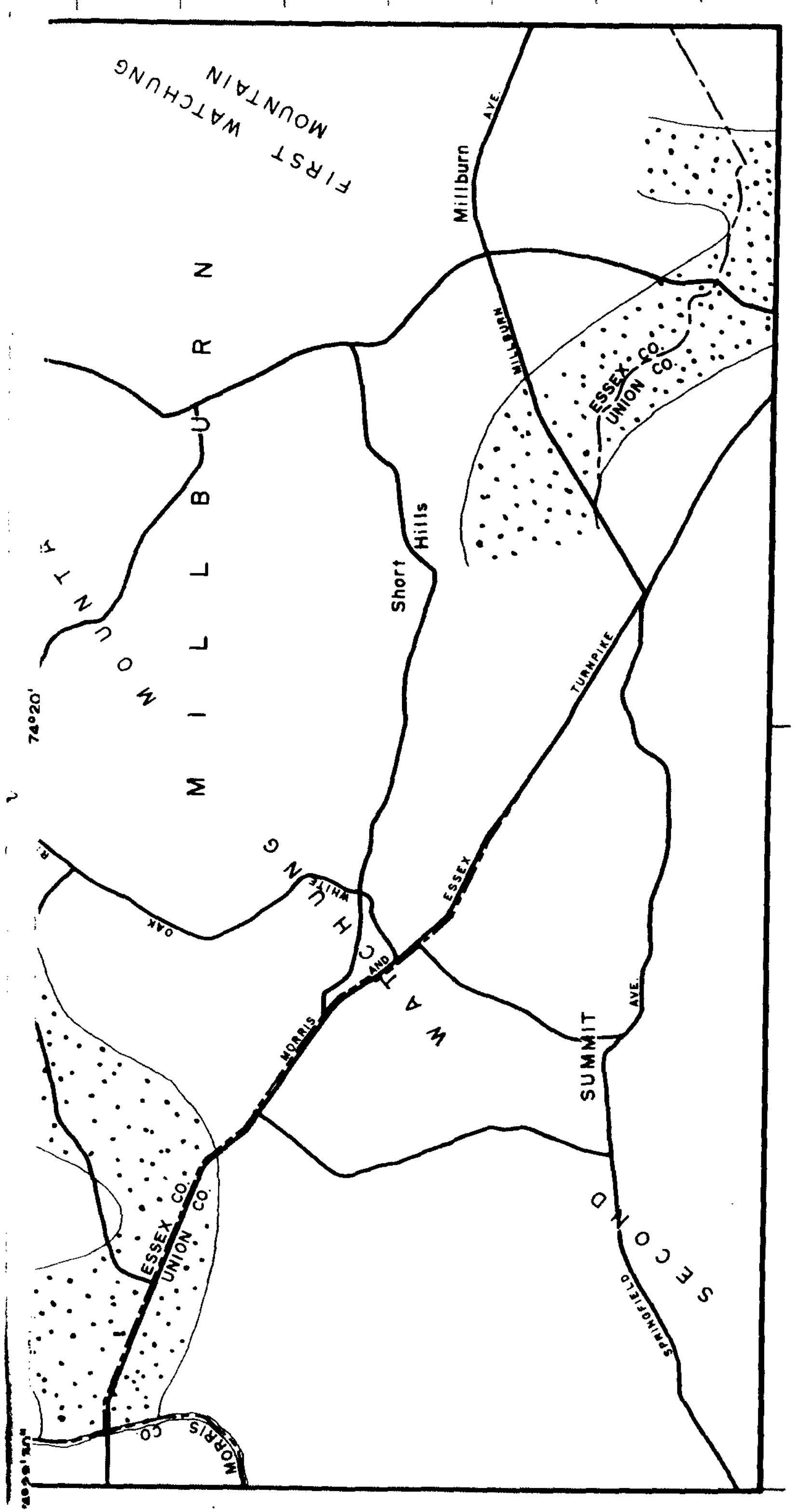


Figure 11.—Distribution of valley-fill aquifers in Millburn and Livingston Townships, Essex County, N. J.

Essex and eastern Morris Counties has demonstrated that the valley-fill aquifers in Essex County are part of an extensive valley-fill aquifer system underlying much of these two counties (Vecchioli and others, 1968). Figure 11 shows the known distribution of valley-fill aquifers in western Essex County.

The most highly developed part of the valley-fill aquifer system is in western Millburn and southwestern Livingston. Four well fields tapping the Pleistocene sand and gravel are located in an area of less than 4 square miles. During 1965 an average of 13.6 mgd (million gallons per day) was pumped from these fields. Such continued heavy development has, naturally, lowered water levels in the aquifer. In 1925, the depth to water in the Canoe Brook well field of Commonwealth Water Company was about 30 feet below land surface. By 1965, the average depth to water in the same field had dropped to 83.5 feet below land surface.

Figure 12 shows the annual mean depth to water in the Commonwealth Water Company's Canoe Brook well field for the 20-year period 1947 to 1966. The water level has declined almost continuously since 1947. This is due in large part to increased demands placed on the adjacent Canoe Brook well fields of the Commonwealth Water Co. and East Orange Water Dept. for most of the period 1947 to 1961. Commonwealth Water Company's Passaic River well field was put into service in 1956 and although the demands on their Canoe Brook field were lessened, the combined pumpage (not shown) continued to increase. However, in spite of the fact that from 1961 to 1966 pumpage from the Commonwealth and East Orange Canoe Brook fields decreased, the water level in the Commonwealth Canoe Brook field continued to decline (fig. 12). Several factors probably have caused this continuing lowering of water level. The Passaic River well field taps the same aquifer and withdrawals there have undoubtedly had some effect on area water levels. In addition, Commonwealth's Canoe Brook well field area has had below average rainfall for 12 of the 13 years since 1953 with a consequent reduction in the amount of available recharge. The reduction in recharge together with increased demands during extended dry periods, especially from 1961 to 1966, have contributed to the steady decline of the water level in the aquifer.

Aquifer tests on the stratified drift deposits have been conducted by the U. S. Geological Survey at two localities in Essex County and at several places in Morris County. The reliability of the results of these tests are questionable for the following reasons: (1) the aquifers are not areally extensive; (2) it is impossible to control or eliminate outside interference; (3) it is [illegible]

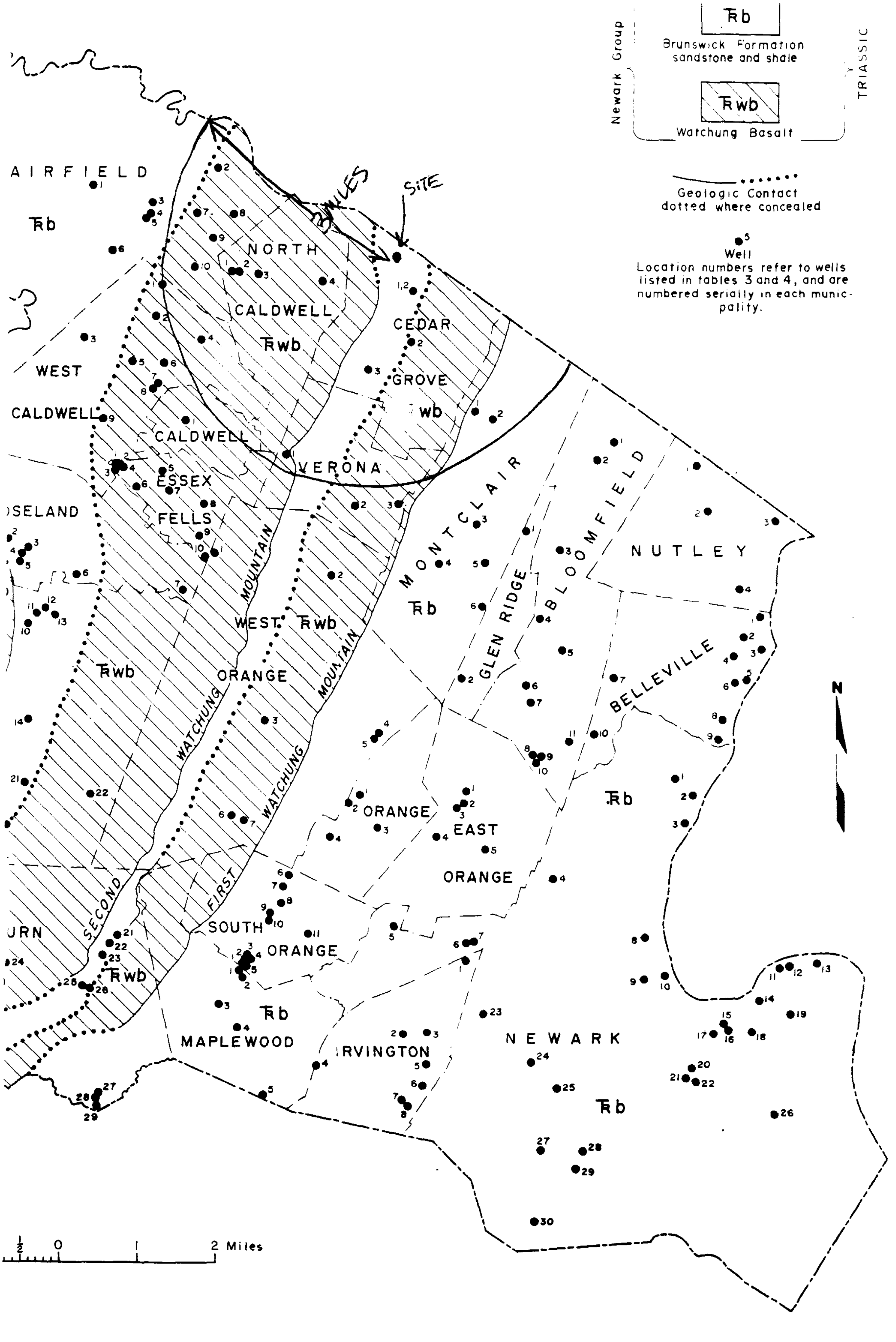


Figure 2. Generalized bedrock

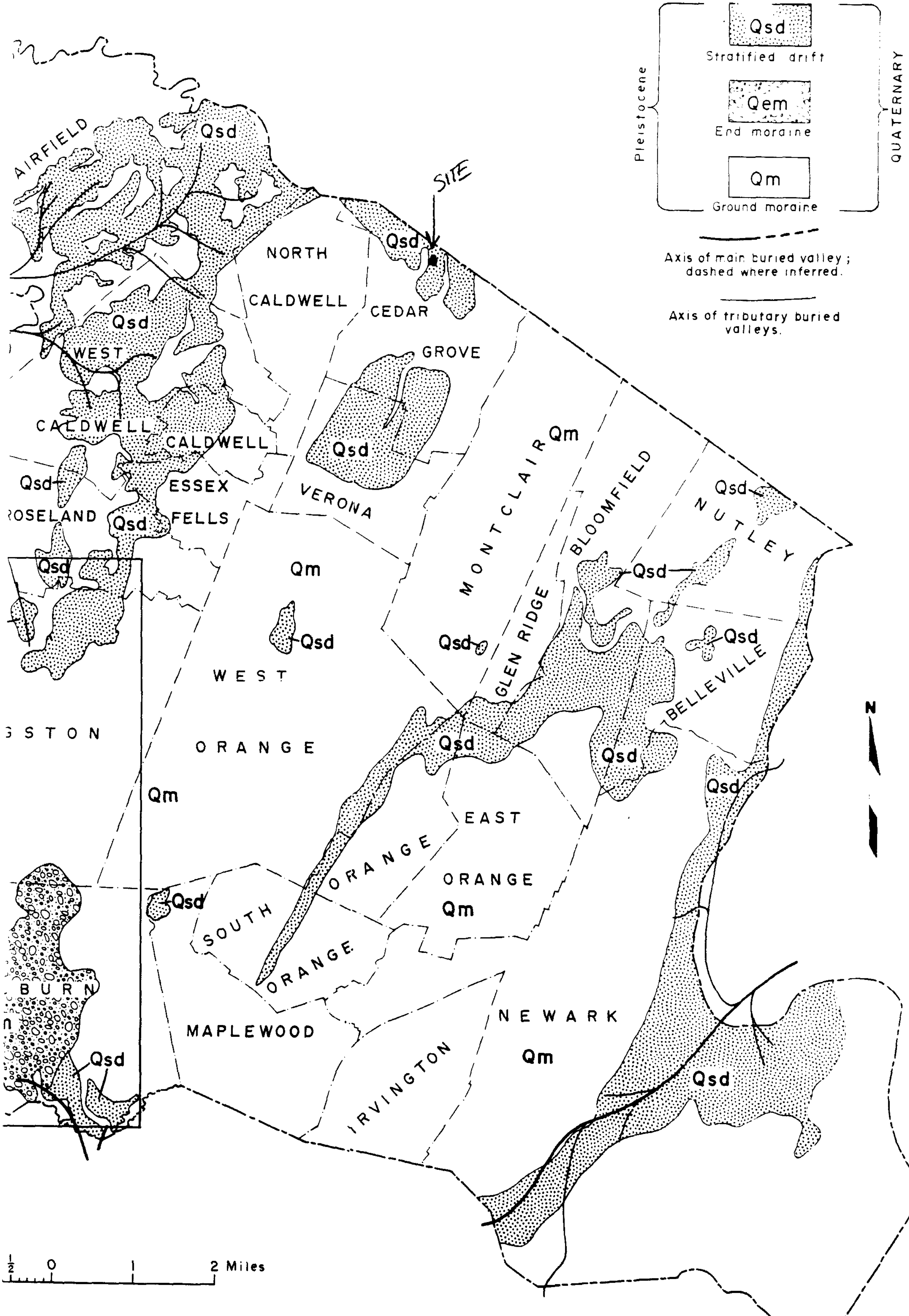

Qsd
Stratified drift
Qem
End moraine
Qm
Ground moraine
Pleistocene
QUATERNARY
Axis of main buried valley; dashed where inferred.
Axis of tributary buried valleys.
SITE
N
NORTH CALDWELL
CEDAR GROVE
WEST CALDWELL
CALDWELL
ESSEX FELLS
ROSELAND
VERONA
MONTCLAIR
GLEN RIDGE
BLOOMFIELD
NUTLEY
BELLEVILLE
WEST ORANGE
EAST ORANGE
SOUTH ORANGE
MAPLEWOOD
IRVINGTON
NEWARK
Qsd
Qm
½ 0 1 2 Miles

FIGURE 3

Aquifer name:
Qsd, Stratified drift
TRb, Brunswick Formation
TRwb, Watchung Basalt

TABLE 2.—RECORDS OF SELECTED WELLS IN ESSEX COUNTY, N. J.—Continued

Remarks:
O.W., Owners well number

Well	Owner or Tenant	Driller	Date Drilled	Altitude above mean sea level (ft)	Total depth drilled below land surface (ft)	Diameter of well (inches)	Depth to which well is cased (ft)	Screen setting (ft)	Aquifer	Static level below land surface (feet)	Yield (gpm)	Draw-down (ft)	Specific capacity (gpm ft)	Remarks
					CALDWELL BOROUGH									
1	Mt. St. Dominic Acad.	---------------------	--------	420	876	---	100	none	TRb	---	25	---	---	
					CEDAR GROVE TOWNSHIP									
1 *	Rich-Tex, Inc.	Burrows Well Drilling Co.	8- 4-51	250	300	6	97	none	TRwb	47	11	58	.18	O.W.1
2 *	Rich-Tex, Inc.	Burrows Well Drilling Co.	11- 5-52	250	105	6	89	75-99	Qsd	43	80	32	2.5	O.W.2
3 *	Brindell Goat Dairy	Algeier Bros.	6-24-58	---	110	6	28	none	TRwb	6	10	84	.13	
4 *	Board of Freeholders	Rinbrand Well Drilling Co.	12- 3-57	---	125	6	117	none	TRwb	70	198	35	5.66	
					EAST ORANGE (CITY)									
1	Colonial Life Ins. Co.	Artesian Well & Equip. Co.	5-10-49	180	357	10	34	none	TRb	26	323	93	3.47	
2	Michael Stein & Co.	Parkhurst Well & Pump Co.	6- 3-49	180	150	8	45	none	TRb	75	50	25	2.0	
3	F. H. Taylor & Sons, Inc.	Burrows Well Drilling Co.	June, 1955	190	254	8	37	none	TRb	38	160	122	1.31	
4	Food Fair Stores, Inc.	Burrows Well Drilling Co.	1956	180	210	8	44	none	TRb	24	---	21	---	
5	New Munn Apts	Rinbrand Well Drilling Co.	6-10-55	---	200	8	39	none	TRb	20	80	60	1.33	
					ESSEX FELLS BOROUGH									
1	Borough of Essex Fells	Artesian Well & Equip. Co.	2-28-42	243	423	10	110	none	TRwb	+8	300	108	2.8	O.W.8
2	Borough of Essex Fells	Artesian Well & Equip. Co.	March, 1959	280	92	17	61	61-88	Qsd	13	457	55	8.31	O.W.14
3	Borough of Essex Fells	Artesian Well & Equip. Co.	10-18-41	285	93	10	72	72-92	Qsd	+3	410	50	8.2	O.W.7
4	Borough of Essex Fells	Artesian Well & Equip. Co.	6-14-46	310	364	10	85	none	TRwb	10	250	114	2.19	O.W.9
5	Borough of Essex Fells	American Water Co.	Sept. 1927	345	97	24 16	45 68-81	45-68 81-97	Qsd	10	627	45	13.9	O.W.1A
6	Borough of Essex Fells	---------------------	1933	325	565	10	65	none	TRwb	+9	146	151	.97	O.W.6
7	Borough of Essex Fells	---------------------	1929	225	295	8	---	none	TRwb	8	400	92	4.35	O.W.5
8	A. Howard	H. A. Kieffer	4-15-56	---	250	6	92	none	TRwb	72	30	54	.56	
9	F. Stearns, Inc.	---------------------	1959	---	196	6	100	none	TRwb	63	40	43	.93	
10	Essex Fells Country Club	H. A. Kieffer	8-15-56	500	300	8	38	none	TRwb	7	55	108	.50	

* WITHIN 3 MILES OF SITE

Aquifer name:
Qsd, Stratified drift
TRb, Brunswick Formation
TRwb, Watchung Basalt

TABLE 2.—RECORDS OF SELECTED WELLS IN ESSEX COUNTY, N. J.—Continued

Remarks:
O.W., Owners well number

Well	Owner or Tenant	Driller	Date Drilled	Altitude above mean sea level (ft)	Total depth drilled below land surface (ft)	Diameter of well (inches)	Depth to which well is cased (ft)	Screen setting (ft)	Aquifer	Static level below land surface (feet)	Yield (gpm)	Draw-down (ft)	Specific capacity (gpm ft)	Remarks
					FAIRFIELD BOROUGH									
1	Fairfield Borough	W. Beatty	1962	- - -	90	8	79	79-90	Qsd	- - -	350	- - -	- -	
2 *	Republic Tool & Mfg. Co.	Algeier Bros.	7-30-52	170	53	6	53	- - -	Qsd	2	40	8	5.00	
3 *	Curtiss Wright Corp.	Artesian Well & Equip. Co.	1941	170	560	10	- - -	none	TRwb	11	155	136	1.14	O.W.4
4 *	Fairfield Borough	H. A. Kieffer	12-26-53	170	185	6	83	none	TRb	20	36	20	1.80	O.W.1
5 *	Fairfield Borough	Burrows Well Drilling Co.	7- 9-64	167	350	10	85	none	TRb	--4	500	64	7.35	
6	De Witt Rubber Mfg. Co.	Algeier Bros.	7-16-54	170	142	6	86	none	TRb	2	25	13	1.92	
7 *	Curtiss Wright Corp.	Artesian Well & Equip. Co.	4- 5-43	175	490	10	- - -	none	TRwb	32	275	85	3.24	O.W.6
8 *	Industry Publications	Algeier Bros.	9-15-54	180	100	6	57	none	TRwb	15	15	10	1.5	
9 *	Williamson & Co., Inc.	H. A. Kieffer	5-15-53	190	510	6	74	none	TRwb	13	25	55	.45	
10 *	Green Brook Country Club	H. A. Kieffer	1958	- - -	300	8	53	none	TRb & TRwb	20	335	28	11.96	O.W.4
					GLEN RIDGE BOROUGH									
1	S. Mendelsohn	Wm. Stothoff Co., Inc.	1-12-51	240	166	6	22	none	TRb	45	30	3	10.00	
2	Chicle Products Co.	- - - - - - - - - - - -	1920	- - -	757	6	110	none	TRb	18	50	52	.96	
					IRVINGTON (TOWN)									
1	Fezem Memorial Home	Wm. Stothoff Co., Inc.	5-19-52	185	304	8	66	none	TRb	75	78	25	3.1	
2	Kles Diner, Inc.	Parkhurst Well & Pump Co.	3-10-55	- - -	250	8	47	none	TRb	31	65	69	.94	
3	American Stores	Parkhurst Well & Pump Co.	7-17-51	160	402	8	45	none	TRb	40	126	80	1.57	O.W.1
4	Olympic Park	A. J. Connally, Inc.	1928	158	300	10	- - -	none	TRb	52	420	78	5.38	
5	Irvington Smelting & Refining Works	Wm. Stothoff Co., Inc.	3-25-53	- - -	304	10	62	none	TRb	40	300	22	13.6	
[illegible]	Jersey Plastic & Die Casting Co.	Wm. Stothoff Co., Inc.	3-26-54	155	400	10	38	none	TRb	94	183	106	1.74	
[illegible]	Gallo Asphalt Co.	F. J. Bott	6- 9-61	150	201	6	107	none	TRb	46	200	24	8.3	
[illegible]	Palnut Co.	Parkhurst Well & Pump Co.	1-27-50	170	229	8	80	none	TRb	45	60	6	10.0	

* - WITHIN 2 MILES OF SITE

Aquifer name:
Qsd, Stratified drift
TRb, Brunswick Formation
TRwb, Watchung Basalt

TABLE 2.—RECORDS OF SELECTED WELLS IN ESSEX COUNTY, N. J.—Continued

Remarks:
O.W., Owners well number

Well	Owner or Tenant	Driller	Date Drilled	Altitude above mean sea level (ft)	Total depth drilled below land surface (ft)	Diameter of well (inches)	Depth to which well is cased (ft)	Screen setting (ft)	Aquifer	Static level below land surface (feet)	Yield (gpm)	Draw-down (ft)	Specific capacity (gpm/ft)	Remarks
					MONTCLAIR (TOWN)									
1*	Rapt & Ruden	Parkhurst Well & Pump Co.	4-29-48	360	250	10	23	none	TRb	5	145	180	.81	
2*	Bond's Ice Cream, Inc.	Parkhurst Well & Pump Co.	3-10-50	510	157	8	21	none	TRb	15	150	55	2.73	
3	Town of Montclair	----------------	1966	---	300	10	41	none	TRb	24	950	51	18.62	
4	Hahne & Co.	Parkhurst Well & Pump Co.	8- 9-49	280	350	8	31	none	TRb	18	350	182	1.92	O.W.2
5	M. Quadrel	Burrows Well Drilling Co.	June, 1955	260	151	6	18	none	TRb	33	75	---	----	
6	Montclair Auto Minit Man	Rinbrand Well Drilling Co.	1-10-50	---	200	6	16	none	TRb	40	60	---	----	
					NEWARK (CITY)									
1	Aluminum Finishing Co.	J. Foster	7-20-53	50	150	6	55	none	TRb	30	100	30	3.33	
2	Wilbur B. Driver Co.	Rinbrand Well Drilling Co.	7- 2-53	15	400	10	93	none	TRb	45	240	155	1.55	O.W.5
3	Pittsburgh Plate Glass Co.	Lauman & Co.	1940	12	---	12	90	none	TRb	9	390	---	----	
4	McEvoy Court Apartments	Parkhurst Well & Pump Co.	Oct. 1939	200	206	6	35	none	TRb	84	60	106	.57	
5	Columbia Theaters, Inc.	Wm. Stothoff Co., Inc.	6- 9-53	---	312	8	26	none	TRb	20	140	32	4.38	
6	Pabst Brewing Co., Inc.	Artesian Well & Equip. Co.	3-14-49	190	685	14	39	none	TRb	59	557	67	8.31	O.W.4
7	Pabst Brewing Co., Inc.	Artesian Well & Equip. Co.	7-17-50	185	687	14	55	none	TRb	108	240	120	2.00	O.W.5
8	Newark Milk & Cream Co.	Rinbrand Well Drilling Co.	Feb. 1949	25	700	10	80	none	TRb	60	75	190	.39	
9	Continental Ins. Co.	S. P. D'Alessio	July 1965	---	300	8	58	none	TRb	77	85	72	1.18	
10	Newark Center Corp.	Garden State Artesian Well & Pump Co.	2-18-55	---	700	10-6	150	none	TRb	81	89	144	.62	O.W.1
11	Kolker Chemical Works	Wm. Stothoff Co., Inc.	12-11-51	12	802	12	127	none	TRb	117	600	43	13.95	O.W.2
12	Kolker Chemical Works	Wm. Stothoff Co., Inc.	4-27-49	8	359	10	98	none	TRb	76	300	22	13.63	O.W.1
13	Eureka Construction Co.	Rinbrand Well Drilling Co.	1-23-59	10	500	8	90	none	TRb	25	75	225	.33	
14	P. Ballentine & Sons	----------------	1937	12	875	16	95	none	TRb	227	375	153	1.79	O.W.8, Plant #2

* - WITHIN 3 MILES OF SITE

Aquifer name:
Qsd, Stratified drift
TRb, Brunswick Formation
TRwb, Watchung Basalt

TABLE 2.—RECORDS OF SELECTED WELLS IN ESSEX COUNTY, N. J.—Continued

Remarks:
O.W., Owners well number

Well	Owner or Tenant	Driller	Date Drilled	Altitude above mean sea level (ft)	Total depth drilled below land surface (ft)	Diameter of well (inches)	Depth to which well is cased (ft)	Screen setting (ft)	Aquifer	Static level below land surface (feet)	Yield (gpm)	Draw-down (ft)	Specific capacity (gpm/ft)	Remarks
					NEWARK (CITY) - Continued									
15	Celanese Corp. of Amer.	P. H. & J. Colan	1924	12	805	16-10	95	none	TRb	176	400	28	14.29	O.W. 26
16	Celanese Corp. of Amer.	Layne-New York Co.	5-16-47	14	856	16-10	75	none	TRb	147	778	40	19.45	O.W. 27
17	J. Hensler Brewing Co.	P. Chaffitelli	12-14-49	12	700	10-8	57	none	TRb	60	450	240	1.79	O.W. 4
18	Synthetic Plastics Co.	Industrial Well & Pump Co.	1-15-63	14	600	8	145	none	TRb	150	300	110	2.73	O.W. 1
19	Ablon Finishes, Inc.	Frank Bott	7-12-60	15	500	8	86	none	TRb	30	360	70	5.14	
20	Coran Corporation	-------	1930	10	290	8	---	none	TRb	140	160	95	1.59	
21	Universal Grain Co.	Wm. Stothoff Co., Inc.	10-18-51	10	303	8	79	none	TRb	143	200	53	3.77	
22	Mother's Food Products, Inc.	---------	1959	11	400	8	107	none	TRb	94	125	8	15.62	
23	Kar Auto Service Co.	P. Chaffitelli	2- 8-50	208	300	6	35	none	TRb	23	60	104	.58	
24	Food Fair Stores	Burrows Well Drilling Co.	April, 1955	100	298	8	35	none	TRb	105	250	45	5.56	
25	S. & S. Super Service Corp.	Rinbrand Well Drilling Co.	2-18-50	50	190	6	94	none	TRb	45	20	---	----	
26	Rutherford & Delaney Holding Co.	Garden State Artesian Well & Pump Co.	7-31-56	---	220	8-6	42	none	TRb	22	100	73	1.37	O.W. 1
7	Linde Air Products Co.	Artesian Well & Equip. Co.	July, 1954	10	500	12	44	none	TRb	17	124	190	.65	
8	C-O Two Fire Equipment Co.	Parkhurst Well & Pump Co.	4-27-50	10	603	10	127	none	TRb	35	89	215	.41	
9	Suburban Motor Lodge, Inc.	Rinbrand Well Drilling Co.	June, 1950	10	555	8	126	none	TRb	15	20	235	.08	
0	S. B. Penick & Co.	Wm. Stothoff Co., Inc.	6- 7-61	---	400	10	75	none	TRb	60	644	23	28.00	O.W. 2
					NORTH CALDWELL BOROUGH									
1 *	Green Brook Country Club	H. A. Kieffer	July, 1951	310	300	8	33	none	TRwb	2	25	81	.31	O.W. 3
2 *	Green Brook Country Club	H. A. Kieffer	March, 1925	290	301	8	---	none	TRb & TRwb	flowing 25 gpm	60	---	----	O.W. 1. Redrilled 1962
3 *	A. Struss	H. A. Kieffer	8-16-55	---	182	6	42	none	TRwb	65	25	5	5.00	
4 *	A. F. Leitner	Algeier Bros.	5-24-58	---	195	6	25	none	TRwb	25	7	125	.05	

* - WITHIN 3 MILES OF SITE

Aquifer name:
Qsd, Stratified drift
TRb, Brunswick Formation
TRwb, Watchung Basalt

TABLE 2.—RECORDS OF SELECTED WELLS IN ESSEX COUNTY, N. J.—Continued

Remarks:
O.W., Owners well number

Well	Owner or Tenant	Driller	Date Drilled	Altitude above mean sea level (ft)	Total depth drilled below land surface (ft)	Diameter of well (inches)	Depth to which well is cased (ft)	Screen setting (ft)	Aquifer	Static level below land surface (feet)	Yield (gpm)	Drawdown (ft)	Specific capacity (gpm ft)	Remarks
					SOUTH ORANGE (VILLAGE)									
1	Village of South Orange	----------------	1913	132	274	8	---	none	TRb	---	200	---	---	O.W. 1
2	Village of South Orange	Artesian Well & Equip. Co.	1950	133	182	10	40	none	TRb	25	170	67	2.54	O.W. 2
3	Village of South Orange	Artesian Well & Equip. Co.	1950	134	115	10	40	none	TRb	28	300	11	27.27	O.W. 3
4	Village of South Orange	Artesian Well & Equip. Co.	1950	132	122	10	49	none	TRb	28	250	50	5.00	O.W. 8
5	Village of South Orange	----------------	1947	132	355	14	---	none	TRb	---	190	---	----	O.W. 14
6	Village of South Orange	Burrows Well Drilling Co.	6- 1-56	148	350	12	45	none	TRb	9	560	41	13.66	O.W. 16
7	Village of South Orange	Burrows Well Drilling Co.	3-11-63	148	200	18-12	36	none	TRb	14	847	24	35.29	O.W. 15
8	Village of South Orange	J. P. Harris	1929	134	301	8	35	none	TRb	1	520	9	57.78	O.W. 11
9	Village of South Orange	J. P. Harris	1931	137	382	16-12	52	none	TRb	20	200	90	2.22	O.W. 12
10	Village of South Orange	J. P. Harris	6-20-30	138	[illegible]	16-12	48	none	TRb	7	490	7	70.00	O.W. 13
11	Village of South Orange	Burrows Well Drilling Co.	5- 1-56	209	[illegible]	12	26	none	TRb	+3	550	78	7.05	O.W. 17
					VERONA BOROUGH									
1*	C. E. Drehman	H. A. Kieffer	10- 1-57	---	200	6	38	none	---	45	18	39	.46	
2*	Montclair Golf Club	Rinbrand Well Drilling Co.	1-10-64	---	500	10-8	16	none	---	20	138	210	.66	
3*	Claremont Diner, Inc.	Algeier Bros.	5-14-54	500	400	8	15	none	TRb & bs	16	45	135	.33	

* - WITHIN 3 MILES OF SITE

Aquifer name:
Qsd, Stratified drift
TRb, Brunswick Formation
TRwb, Watchung Basalt

TABLE 2.–RECORDS OF SELECTED WELLS IN ESSEX COUNTY, N. J.–Continued

Remarks:
O.W., Owners well number

Well	Owner or Tenant	Driller	Date Drilled	Altitude above mean sea level (ft)	Total depth drilled below land surface (ft)	Diameter of well (inches)	Depth to which well is cased (ft)	Screen setting (ft)	Aquifer	Static level below land surface (feet)	Yield (gpm)	Draw-down (ft)	Specific capacity (gpm ft)	Remarks
					WEST CALDWELL BOROUGH									
*1	Mal Bros. Contracting Co.	Algeier Bros	11-15-57	180	135	6	32	none	TRwb	4	30	81	.37	
*2	Mt. Ridge Country Club	Parkhurst Well & Pump Co.	1933	- - -	252	8	119	none	TRwb	42	85	44	1.93	
*3	Ferncliff Golf Club	H. A. Kieffer	2-28-55	180	305	8	79	none	TRb	14	90	14	6.43	
4	Elm-Tre Pool & Club	H. A. Kieffer	1926	260	170	- - -	- - -	none	TRb	- - -	60	- - -	- - -	
5	Caldwell Enterprises	Burrows Well Drilling Co.	3- 9-56	190	100	8	61	none	TRwb	+3	110	63	1.75	Flowed 30 gpm at +3
6	Borough of Essex Fells	Artesian Well & Equip. Co.	1957	335	254	18-12	100	none	TRwb	13	262	164	1.59	O.W. 13
7	Borough of Essex Fells	Rinbrand Well Drilling Co.	1927	240	360	12-8	80	none	TRwb	+	175	- - -	- - -	O.W. 4B Flowed 40 gpm
8	Borough of Essex Fells	Rinbrand Well Drilling Co.	1924	240	185	- - -	- - -	none	TRwb	0	225	80	2.81	O.W. 4A
9	S. Crane	H. A. Kieffer	12-10-51	- - -	250	8	87	none	TRwb	8	90	43	2.09	
						WEST ORANGE								
1	Borough of Essex Fells	- - - - - - - - - - - - - - -	1940	495	37	52-24	28	27-37	Qsd	8	190	27	7.03	O.W. 2
2	Bow & Arrow Manor, Inc.	H. A. Kieffer	11-20-58	540	126	8	22	none	TRwb	28	50	37	1.35	O.W. 3
3	Essex County Country Club	Parkhurst Well & Pump Co.	9- 8-54	560	115	8	21	none	TRb & TRwb	+2	100	102	.98	O.W. 1
4	Nickle Alkaline Battery	Rinbrand Well Drilling Co.	3-21-62	- - -	505	8	58	none	TRb	12	190	213	.89	O.W. 2
5	Nickle Alkaline Battery	Rinbrand Well Drilling Co.	9-26-61	- - -	520	8	46	none	TRb	15	190	210	.90	O.W. 1
6	Rock Spring Country Club	H. A. Kieffer	2-28-56	510	406	8	20	none	TRb	110	25	90	.28	O.W. 1
7	Rock Spring Country Club		1957	- - -	750	8	22	none	TRb	273	35	25	1.40	O.W. 2

* - WITHIN 3 MILES OF SITE

REFERENCE NO. 3

SUMMARY OF GEOLOGY AND GROUND-WATER RESOURCES OF PASSAIC COUNTY, NEW JERSEY

By L. D. Carswell and J. G. Rooney

U.S. GEOLOGICAL SURVEY
Water-Resources Investigations 76–75

Prepared in cooperation with
NEW JERSEY DEPARTMENT OF ENVIRONMENTAL
PROTECTION, DIVISION OF WATER RESOURCES

June 1976

SUMMARY OF GEOLOGY AND GROUND-WATER RESOURCES
OF PASSAIC COUNTY, NEW JERSEY

By
L. D. Carswell and J. G. Rooney

ABSTRACT

Ground water in Passaic County occurs in intergranular openings of unconsolidated stratified deposits of Quaternary age and in joints and fractures in consolidated rocks of Precambrian, Paleozoic, and Triassic age.

The Brunswick Formation of Triassic age is the most important aquifer in the southeastern one-third of Passaic County. Reported yields of public supply and industrial wells range from 50 to 510 gallons per minute (3 to 32 litres per second) and the median yield is 130 gallons per minute (8 litres per second). Most of these wells are 200 to 400 feet (61 to 122 metres) deep. The median yield of all public supply and industrial wells over 300 feet (91 metres) deep and 8 inches (203 millimetres) or larger in diameter is 230 gallons per minute (15 litres per second). Crystalline rocks of Precambrian age are the major source of ground water for domestic use in the northwestern two-thirds of Passaic County. Reported well yields range from 1 to 200 gallons per minute (.06 to 13 litres per second). The median reported yield of domestic wells is 5 gallons per minute (.31 litres per second) and that of public supply wells is 30 gallons per minute (2 litres per second).

Other consolidated rocks--rocks of Paleozoic age and the Watchung Basalt of Traissic age--are utilized primarily for domestic water supplies in Passaic County. Reported yields of wells tapping the Paleozoic rocks range from less than 1 to 35 gallons per minute (.06 to 2 litres per second) and the median yield is 10 gallons per minute (.63 litres per second). Reported yields of domestic wells tapping the Watchung Basalt range from less than 1 to 40 gallons per minute (.06 to 3 litres per second) and the median yield is 12 gallons per minute (.76 litres per second). However, reported yields of nine industrial and commercial wells range from 50 to 180 gallons per minute (3 to 11 litres per second).

Unconsolidated stratified deposits of Quaternary age are locally an important source of ground water for public supply and industrial use in parts of Passaic County. These deposits have not been extensively explored but are potentially an important source of ground water for future development. Reported yields of wells tapping the stratified deposits range from 4 to 920 gallons per minute (.25 to 58 litres per second). The median reported yield of domestic wells is 16 gallons per minute (1 litre per second) and that of public supply and industrial wells is 130 gallons per minute (8 litres per

second. Depths of wells depend upon the thickness of the deposits. Reported depths range from 22 to 170 feet (7 to 52 metres).

The quality of ground water in Passaic County varies from one aquifer to another. Water from the Precambrian rocks is soft to moderately hard (34 to 104 milligrams per litre) and is low in dissolved solids (66 to 159 milligrams per litre). Water from the Brunswick Formation is moderately hard to very hard (89 to 540 milligrams per litre). The dissolved solids content ranges from 129 to 563 milligrams per litre). The occurrence of more highly mineralized water at depth in the Brunswick Formation is indicated by an analysis, made in 1885, of 16,000 milligrams per litre of dissolved solids at a depth of 2,050 feet (625 metres) in a well in Paterson. Water from two wells tapping the Quaternary deposits is moderately hard (65 and 83 milligrams per litre) and has dissolved solids contents of 122 and 133 milligrams per litre).

Water use from both surface and ground-water supplies in Passaic County averaged about 106 million gallons per day (4.6 cubic metres per second) in 1965. Ground water probably accounts for 5 to 10 percent of this total. Ground-water pumpage by the major public supply companies in the county has increased from 2.1 million gallons per day (.09 cubic metres per second) in 1951 to 4.39 million gallons per day (.19 cubic metres per second) in 1968. About 80 percent of the 4.39 million gallons per day (.19 cubic metres per second) was from wells tapping the Brunswick Formation in the southern part of the county.

INTRODUCTION

Purpose and Scope

This is one of a series of County ground-water reports authorized by the Water Supply Act of 1958 and its companion Water Bond Act. These reports present assembled data and interpretation on the availability, occurrence, movement, and chemical quality of ground water in New Jersey. This investigation was made by the U.S. Geological Survey in cooperation with the New Jersey State Department of Environmental Protection, Division of Water Resources. The report was prepared under the supervision of John E. McCall and Harold Meisler, consecutive District Chiefs.

Location and Extent of Area

Passaic County is located in northcentral New Jersey (fig. 1). It is bounded on the north by the State of New York and Bergen County, on the east by Bergen County, on the south by Essex and Morris Counties, and on the west by Sussex County. The county is shaped roughly like an hour glass with the top to the northwest, and the bottom to the southeast. It lies between longitudes 74°06'W and 74°30'W and latitudes 40°48'N and 41°12'N and contains 194 mi^2 (square miles) [502 km^2 (square kilometres)] of land area and 8 mi^2

(21 km^2) of water. Paterson is the county seat; other major communities include Passaic and Clifton.

Previous Investigations

The geology of the southeastern third of Passaic County is described in the Passaic Folio (Darton and others, 1908). A northeast-trending 30-square mile (78 km^2) outlier of Paleozoic rocks in the northwestern part of the county is described by Kümmel and Weller (1901). Hotz (1953) described the Precambrian igneous and metasedimentary rocks in a 15-square mile area (39 km^2) in the vicinity of Hewitt and Ringwood as a part of his study of magnetite deposits. The bedrock geology of the area immediately north of Passaic County in New York has recently been described by Offield (1967) who presents an excellent review of the rock types of the highlands and the stratigraphic terminology. Salisbury (1902) described the Quaternary deposits in his report on the glacial geology of New Jersey. The availability of ground water in Passaic County is summarized by Widmer and others (1966) in Water Resources Resumé State Atlas Sheet No. 23 and its companion volumes for Atlas Sheets No. 22 and No. 26. The availability of ground water in Morris and Essex Counties is described, respectively, by Gill and Vecchioli (1965) and Nichols (1968). A report on the water resources of the Ramapo River basin, New Jersey, by Vecchioli and Miller (1973) covers a part of Pompton Lakes Boro and Wayne Township in Passaic County and an elongate area just to the northeast of the county.

Methods Used in this Investigation

During this investigation records of more than 1,500 wells were collected and analyzed for information on well yields and depths, static water levels, and the thickness and lithology of Pleistocene deposits. Field work included the location of most of the public-supply wells and many of the industrial wells and reconnaissance of the geology of the county. Many of the wells for which records were available, particularly in the northwestern two-thirds of the County, were drilled for domestic use. The locations of most of the domestic wells used for this report are from applications for permit to drill submitted to the New Jersey Bureau of Geology by the prospective owner or driller.

Records of selected wells are given in table 2; their locations are shown in figure 2. Each well is identified by a well number which is prefixed with an abbreviation of the name of each township, city, or borough in which the well is located. Municipal abbreviations are as follows:

Municipality	Abbreviation	Municipality	Abbreviation
Bloomingdale	Bl	Pompton Lakes	PL
Clifton	Cl	Prospect Park	PP
Haledon	Hl	Ringwood	Ri
Hawthorne	Hw	Totowa	To
Little Falls	LF	Wanaque	Wn
North Haledon	NH	Wayne	Wy
Passaic	Ps	West Milford	WM
Paterson	Pt	West Paterson	WP

The wells within each municipality are numbered serially, generally starting from the northern margins of each municipality. Thus, well Ri-2 is located in the northern part of Ringwood and well Ri-30 is in the southern part.

Acknowledgments

The cooperation of Dr. Kemble Widmer, the State Geologist of New Jersey, is gratefully acknowledged for providing access not only to the well-organized and voluminous file of well records maintained by the New Jersey Bureau of Geology, but in addition, to the manuscript copies of Water Resources Resumés of State Atlas Sheets No. 22 and 26 which are being prepared for publication by the State Survey. Other members of the New Jersey Geological Survey, including Joseph Miller, provided assistance during the data gathering phase of this investigation.

GEOGRAPHY

Topography and Drainage

The northwestern two-thirds of Passaic County is in the New Jersey Highlands, a subdivision of the Reading Prong of the New England physiographic province. The southeastern one-third of the county is the Lowland section of the Piedmont physiographic province.

The Highlands are an area of moderate topographic relief largely underlain by gneiss of Precambrian age but also including an outlier of folded sedimentary rocks of Paleozoic age which form a series of parallel ridges and valleys in the western third of the Highlands area. The ridges and valleys formed on the rocks of Paleozoic and Precambrian age have a prominent northeast-southwest alignment reflecting the dominant structural orientation of the rocks as well as the direction of movement of the ice which overrode the area during the Wisconsin Glaciation. Hotz (1953, p. 159) reports that the topographic expression of major cross faults are well defined trench-like structures apparent on aerial photographs. These faults strike east-west, interrupt minor drainage lines, and offset small valleys and ridges.

Altitudes in the Highlands range from 1,491 ft (feet) [454 m (metres)] on Bearfort Mountain to 200 ft (61 m) on the Wanaque River at Pompton Lakes. The maximum local relief is 850 ft (259 m) between the crest of Bearfort Mountain and the valley immediately to the east. Northwest of the outlier of Paleozoic rocks, valleys partially filled with glacial deposits are at an altitude of about 1,200 ft (366 m). Immediately to the east of the outlier the valleys are at an altitude of 600 to 800 ft (183 to 244 m), and the valley of the Wanaque on the eastern side of the Highlands is at an altitude of 300 ft (91 m).

The Highlands in Passaic County are drained by the Pequannock, Wanaque, and Ramapo Rivers which join to form the Pompton River, a tributary of the Passaic River. A small area in the northwest corner of the County is drained by the northeastward-flowing Long House Creek, a tributary of the northward-flowing Wallkill River.

In the Highlands area, eastward-flowing streams generally have steeper gradients than streams parallel to the regional structure of the Precambrian and Paleozoic rocks. The eastward-flowing streams are presumably controlled by erosion along transverse joints and shear zones associated with cross faults; whereas, the valleys and local topographic lows containing Upper Greenwood Lake, Greenwood Lake, and the lower Wanaque River are all apparently developed along major longitudinal or oblique faults.

The Highlands area in Passaic County is largely developed as a watershed for surface-water supply; approximately one quarter of the land area used for this purpose is municipally owned. This area contains or partially contains Oak Ridge, Clinton, and Charlotteburg Reservoirs, and Echo Lake, which are regulated bodies of surface water in the Pequannock River drainage and are utilized for water supply by the City of Newark. Upper and Lower Greenwood Lakes and Wanaque Reservoir in the Wanaque River drainage are used for surface-water supply by the North Jersey District Water Supply Commission.

The Piedmont Lowland in Passaic County is underlain by igneous and sedimentary rocks of Traissic age. The sedimentary rocks throughout most of the area underlie gently rolling topography one to three hundred feet in altitude. This gently rolling topography is broken by the abrupt arcuate ridges of the First and Second Watchung Mountains and Packanack Mountain which are underlain by three successive sheets of basalt. The highest altitude in the Piedmont area is 885 ft (270 m) on High Mountain, a knob of the Second Watchung Mountain. The lowest altitude is sea level along the tidal portion of the Passaic River on the southeastern boundary of the County. Drainage is to the Passaic River which flows in an irregular but dominantly eastward direction across the Piedmont Lowlands traversing the Watchung Mountains through gaps at Little Falls and Paterson. The Pompton River flows southward from the Highlands across the Piedmont Lowlands joining the Passaic River near Mountain View after passing through a gap in Packanack Mountain. Smaller streams, in general, parallel the ridges of the Watchung Mountains.

Passaic County is entirely within the part of northern New Jersey that has been subject to Wisconsin Stage glaciations. Consequently, the topography shows the effects of both glacial erosion and deposition. In general, the ridges have been scraped clean and contain abundant bedrock outcrops; whereas, the valleys are filled with a variety of unconsolidated deposits which extend part way up the flanks of the adjacent high areas.

Climate

The climate of Passaic County is continental in character being controlled largely by storms which move from west to east across the county. These storms are generally dominated by polar continental air masses in winter and tropical air masses in summer. Although part of the precipitation in Passaic County results from the storms which move from west to east across the county, the heaviest rains are produced when coastal storms of tropical origin move inland.

Precipitation throughout the county averages 48 in (inches) [122 mm (millimetres)] annually and is normally well distributed throughout the year. Because the Highlands area is generally higher in altitude than the Piedmont Lowlands, the temperature in the Highlands averages several degrees cooler than in the Piedmont Lowlands in both summer and winter. Although both areas receive equal precipitation, the cooler Highlands receive more than 6 in (152 mm) more snowfall than the Lowlands.

At Paterson the frost-free periods average 192 days from April 16 to October 25. The frost-free period at Charlotteburg in Passaic County averages only 128 days, from May 20 to September 25. In the northwestern portion of the county the growing season is even shorter. The average July temperature is 75.9°F (24°C) at Paterson and 71.2°F (22°C) at Charlotteburg In January the average temperature is 31.9°F (0°C) at Paterson and 29°F (2°C) at Charlotteburg (U.S. Weather Bureau, 1959).

Population and Economic Development

In 1960 the population of Passaic County was 406,518, a 20 percent increase over 1950. This increase has been predominately in the suburban areas such as North Haledon, Pompton Lakes, Totowa, and Wayne which over the 10-year period had population increases of 69.7, 102.9, 80.3, and 148.3 percent, respectively. Municipalities having the largest population are Clifton (32,084), Paterson (143,663), and Passaic (153,963). The population increased 27.2 percent in Clifton and 3.1 percent in Paterson and decreased 6.5 percent in Passaic.

The northwestern part of the county comprises 124 mi^2 (321 km^2) or 65 percent of the total area of the county, but contains only 6 percent of the total population. This area of the county is used predominantly for recreation and water supply. The reservoirs and watersheds owned by Newark and the North Jersey District Water Supply Commission cover approximately one quarter of the area. The southern part of the county is highly industrialized. Manufacturing includes textile, apparel, leather products, metal products, and electrical and nonelectrical machinery. Only 3 percent of the land area in the county is devoted to agriculture.

GEOLOGY

General Considerations

The bedrock underlying the Highlands is composed of crystalline rocks of Precambrian age, an outlier of sedimentary rocks of Paleozoic age, and a small fault-bounded wedge of black shale of Paleozoic age near Pompton Lakes. The bedrock geology of Passaic County is shown in figure 3. The crystalline rocks include the Franklin Limestone and metasedimentary and igneous gneisses. The outlier of Paleozoic age is bounded on the northwest by a fault which closely parallels the strike of the beds. On the east side of the outlier the sedimentary rocks lie unconformably on the Precambrian gneiss. The southeastern third of Passaic County, the Lowlands, is underlain by mudstone, sandstone, conglomerate, and basalt of Triassic age.

Unconsolidated deposits overlie the bedrock in both the Highlands and the Lowlands and are largely related to the last advance and retreat of the continental glacier across the area in Wisconsin time. These unconsolidated deposits are generally thick and continuous in valleys and on lower hill slopes and thin to absent on hilltops. The deposits on the upper slopes of the hills and hilltops were deposited directly by the glacier and are largely till consisting of an unstratified mixture of clay, silt, sand, gravel, and boulders. The deposits in the valleys and lower slopes of the hills locally contain till in addition to well-sorted stratified clays, sands, and gravels deposited by streams or in lakes.

Precambrian Rocks

The Precambrian igneous and metasedimentary rocks in northwestern Passaic County have been referred to as Pochuck, Losee, and Byram in reports on the geology of the area (Johnson, 1950). These older map units have subsequently been found inadequate for the purposes of detailed mapping and have been discarded by recent workers (Sims, 1958; Hotz, 1953; Offield, 1967; and Smith, 1969). Recent practice has been to assign descriptive mineralogic terms to a much greater number of lithologic units mapped in the field. These units include; hypersthene-quartz andesine gneiss, pyroxene quartz feldspar gneiss, quartz feldspar biotite gneiss, amphibolite, granite and granitic gneiss, and Franklin Limestone. Distribution of these units is shown in figure 3. Because the occurrence and movement of ground water appears to be similar in all these lithologic units they are not described in detail in this report.

The Precambrian rocks are characteristically gneissic, granitoid, foliated, and structurally complex. The gneisses are cut by northeast-trending faults which parallel the regional strike of the rock units and by transverse (east-west) trending faults.

The regolith and soil that had developed on top of the Precambrian rocks during Tertiary time was almost entirely removed by Pleistocene glaciation.

Few drillers' logs indicate the presence of weathered and decomposed gneiss. The gneiss presents a fresh, unweathered appearance in outcrop. Salisbury (1894, p. 17) reported that the surface of the gneiss beneath the till was smooth and polished and that it was the exception to find it weathered.

Paleozoic Rocks

Rocks of Cambrian, Ordovician, Silurian, and Devonian age in western Passaic County underlie a 2- to 3.5-mile (3 to 6 km) wide belt trending northeasterly from the Pequannock River to the New York State line. This belt is part of a synclinal outlier of Paleozoic rocks, approximately 60 mi (97 km) in length. The main outcrop area occurs 25 mi (40 km) to the northwest. The syncline is truncated on the northwest by a fault which places strata of Devonian age in contact with Precambrian gneiss. On the southeast side of the syncline quartzite of Cambrian age and conglomerate of Silurian age lie unconformably upon the gneiss. Kümmel and Weller (1901) have mapped a small syncline within the belt of Paleozoic rocks on the west side of Greenwood Lake. The small syncline contains strata of Silurian and Devonian age and is truncated on the northwest by a fault that extends from the New York State line southeastward to the vicinity of West Milford.

Near Pompton Lakes an area of less than 1 mi^2 (3 km^2) is underlain by black shale of Ordovician age. According to Darton and others (1908) the shale is bounded by faults.

The Paleozoic sedimentary rocks of the outlier in western Passaic County are the Hardyston Quartzite of Cambrian age, the Kittatinny Limestone of Cambrian and Ordovician age, a black shale unit of Ordovician age, the Green Pond Conglomerate, Longwood Shale, and Decker Limestone of Silurian age, and the Kanouse Sandstone, Cornwell Shale, Bellvale Sandstone of Darton (1894), and Skunnemunk Conglomerate of Devonian age. The following brief descriptions of Paleozoic sedimentary rocks of Passaic County are based largely on the descriptions of Kümmel and Weller (1902).

Hardyston Quartzite--The Hardyston Quartzite of Early Cambrian age is the oldest unmetamorphosed sedimentary formation in Passaic County and underlies a narrow belt on the eastern side of the Paleozoic rock outlier. The Hardyston is about 30 ft (9 m) thick and is composed of vitreous blue quartzite which grades upward into calcareous sandstone which is white and very friable where weathered.

Kittatinny Limestone--The Kittatinny Limestone is a massively bedded, silicious, bluish gray limestone of Cambrian and Ordovician age. The contact between the Kittatinny and the underlying Hardyston is gradational. Erosion, prior to the deposition of the overlying Green Pond Conglomerate, has removed all but about 130 ft (40 m) of this unit which is 2,500 to 3,000 ft (762 to 914 m) thick in western New Jersey. The limestone occasionally contains pockets of conglomerate which were considered by Kümmel and Weller (1902, p. 8) to be masses of the overlying Green Pond Conglomerate that filled the fractures and crevices in the deeply weathered and eroded surface developed on top of the Kittatinny.

Black Shale.--This black shale of Ordovician age underlies Pompton Lakes. Although it shows only a moderate degree of metamorphism, it was mapped as Hudson Schist* by Darton and others (1908) because of its presumed equivalence to the schists of Ordovician age which crop out 20 mi (32 km) to the east along the Hudson River. Two small areas (not shown in figure 3) of similar nonfossiliferous black shale are found in the outlier of Paleozoic rocks near Oak Ridge Reservoir in western Passaic County and were referred to as Hudson River Shale* by Kümmel and Weller (1902, p. 8). The black shale is probably equivalent to the Martinsburg Formation in western New Jersey. A few miles north of Passaic County in New York presumed Martinsburg equivalents have been subdivided into a number of distinct formations. Inasmuch as the correlation of the nonfossiliferous shale with either the section in New York or that of the type Martinsburg is uncertain, no formal stratigraphic name is applied to the unit here. As the area underlain by the shale is small, the shale is considered hydrologically unimportant for purposes of this report.

Green Pond Conglomerate.--The Green Pond Conglomerate of Silurian age lies unconformably upon an erosional surface which cuts across rocks of Precambrian, Cambrian, and Ordovician age. The Green Pond characteristically has a pinkish color, is 1,200 to 1,500 ft (366 to 457 m) thick, and is a coarse silicious conglomerate which is interbedded with and grades into quartzite and sandstone. The Green Pond is very resistant to erosion thus forming the comparatively high steep slopes of Kanouse Mountain, a linear ridge extending from Charlotteburg north to West Milford. Locally, the basal beds are friable where they contain significant amounts of reworked Kittatinny Limestone but more typically the Green Pond contains silicious cement and is very hard.

Longwood Shale.--The Longwood Shale of Silurian age crops out intermittently in a narrow belt to the west of Kanouse Mountain. It consists of about 200 ft (61 m) of red shale and conformably overlies the Green Pond Conglomerate. The cleavage in the shale generally obscures bedding.

Decker Limestone.--The Decker Limestone is a dark gray, impure, shaley, and silicious limestone. It is 40 to 50 ft (12 to 15 m) thick and is the youngest Silurian formation in the area.

Kanouse Sandstone.--The Kanouse Sandstone of Devonian age is 215 ft (65 m) thick. It consists of a lower white, thick bedded, fine grained quartzose conglomerate that is about 100 ft (30 m) thick and an upper greenish, hard thin-bedded quartzose sandstone. The conglomerate is usually friable but, locally, cementation with silica has formed a hard quartzite.

Cornwell Shale.--The Cornwell Shale is a black to dark gray slaty shale having gradational contacts between both the overlying Bellvale Sandstone of Darton (1894) and the underlying Kanouse Sandstone. It is about 1,000 ft (305 m) thick.

*The names Hudson Schist and Hudson River Shale have not been adopted by the U.S. Geological Survey.

Bellvale Sandstone of Darton (1894).--The Bellvale Sandstone is a dark-gray, hard, flaggy to thick bedded, fine- to medium-grained sandstone. The formation contains alternating beds of red and green shale, sandstone, and conglomerate near the top. Kümmel and Weller (1902, p. 23) report a thickness of 1,600 to 2,000 ft (488 to 610 m) for the Bellvale Sandstone.

Skunnemunk Conglomerate.--The Skunnemunk Conglomerate is a purple and maroon, massively bedded conglomerate containing beds of reddish sandstone and shale. The formation is 2,500 ft (762 m) thick, very hard, and resistant to erosion. It underlies the comparatively high rugged terrain of Bearfort Mountain.

Triassic Rocks

The rocks of Triassic age that underlie the southern one-third of Passaic County are the Brunswick Formation and the Watchung Basalt. See figure 3. The Brunswick and the Watchung are a part of the Newark Group which elsewhere in New Jersey includes two units (Stockton and Lockatong Formations), not present in Passaic County. The rocks generally have a monoclinal dip of 10° to 15° W., but they contain some gentle open folds such as those expressed by the arcuate form of the Watchung Mountains. The Newark Group is bounded on the northwest by a fault which places it in contact with Precambrian gneiss and Ordovician shale. The rocks are cut by a number of north- to northeast-trending high angle faults which are evident (see figure 3) where they offset the contact between the Watchung Basalt and the Brunswick Formation.

Brunswick Formation

The Brunswick Formation forms broad valleys between the Watchung Mountains and gently rolling lowlands east of First Watchung Mountain. The Brunswick consists of alternating beds of reddish-brown sandstone and mudstone. The texture of the rocks is generally coarser in the northern part of the area than in the southern part. Conglomerates occur a little below the base of the basalt flow underlying First Watchung Mountain and locally along the northwestern border of the outcrop area. These "border conglomerates" are composed of pebble derived from Precambrian gneiss and Paleozoic rocks that cropped out in the Highlands during Triassic time.

Watchung Basalt

Intercalated between the beds of the Brunswick Formation are three sheets of basalt which form the crest of the First and Second Watchung Mountains and Packanack Mountain. Each basalt sheet is made up of a series of lava flows which outpoured during the deposition of the Brunswick Formation. Individual flows usually have vesicular zones at their tops and bases. The basalt sheets that form First and Second Watchung Mountains, and Packanack Mountain are approximately 600, 850, and 300 ft (183, 259, 91 m) thick, respectively (Darton and others, 1908, p. 10).

Quaternary Deposits

Bedrock in Passaic County is largely concealed beneath unconsolidated deposits genetically related to the continental ice sheets that overran the entire county during the Wisconsin Stage of the Pleistocene Epoch. As the glacier advanced across the county existing drainage systems were blocked by ice and modified by glacial erosion and deposition. Stream gradients were temporarily altered by warping of the earth's crust as a result of the weight of the ice. This combination of factors resulted in constant readjustment of drainage in front of the ice sheet as it advanced and withdrew from the area. Many lakes were formed; the largest of these, known as Lake Passaic, covered the area which lies between the Second Watchung Mountain and the Highlands in Passaic, Essex, Morris, Union, and Somerset Counties. The development and subsequent drainage of Lake Passaic is described by Salisbury (1902) and Salisbury in Darton and others (1908).

Glacial deposits consist of boulders, gravel, sand, silt, and clay largely derived from the local bedrock. The deposits are broadly subdivided on the basis of whether they are stratified or unstratified. The unstratified deposits (till) are not sorted, contain rock fragments from clay size to boulders, and were deposited directly from the glacier. The stratified deposits are not only layered but moderately to well sorted as a consequence of their having been transported in meltwater and deposited in streams or lakes.

The stratified deposits of Passaic County are, in this report, grouped into three categories; (1) deposits formed prior to the last advance of the glacier, (2) deposits resulting from the last advance of the glacier, and (3) deposits formed after the retreat of the glacier and associated with present day drainage.

Stratified deposits formed prior to the last advance of the glacier in the county are thin [2 to 50 ft (.61 to 15 m) thick] sands and gravels which overlie bedrock and are overlain by till or lake beds. These deposits occur characteristically in or near the base of buried pre-glacial or inter-glacial stream valleys.

Stratified deposits resulting from the last advance of the ice sheet include kames, which were formed in contact with the ice, coarse outwash deposits, and lake deposits. The kames in general are on the flanks of the Watchung Mountains and between Second Watchung and Packanack Mountains in central Wayne Township. The coarse outwash deposits formed deltas in the highlands. Available well logs do not always permit a clear distinction to be made between coarse outwash deposits and sands and gravels deposited prior to the last advance of the glacier. Both deposits intertongue with and are overlain by finer grained sediments. Lake deposits consist largely of laminated silt and clay which are up to 100 ft (30 m) thick in the valleys between Second Watchung Mountain and the Highlands.

The lake deposits are overlain by deposits associated with present day drainage. These include swamp deposits of organic muck and alluvium on the flood plains of the major streams. Alluvium is composed of silt and fine sand and is generally not more than 20 ft (6 m) thick.

The areal distribution of the surficial deposits of roughly the southern one third of Passaic County is shown in the Passaic Folio (Darton and others, 1908). Surficial geology of the northern two thirds of the county is shown in Salisbury (1902). An indication of the distribution of Quaternary deposits is given by Rogers and others (1951) in an engineering soil survey of Passaic County.

The thickness of the Quaternary deposits and the distribution of known subsurface lithologies in Passaic County are indicated in figure 4. This map is a first approximation as it is based on drillers' logs of variable quality and the locations and altitudes of wells have not been checked in the field. The deposits are thin to absent on the hills and are thickest in the present day valleys, particularly where they fill pre glacial or inter glacial valleys. Maximum known thickness is about 220 ft (67 m) in the valley of the Pequannock River near Pompton Lakes.

Structure

The structural grain in Passaic County is formed by the northeast strike of the layers and foliations of the sedimentary, igneous, and metamorphic rocks, and the parallel trends of fold axis and major faults. The major northeast-trending faults bound large blocks and commonly have vertical displacements of thousands of feet. The northwest part of each structural block is depressed in relation to the adjoining block bringing rocks of Paleozoic and Triassic age adjacent to the much older Precambrian gneisses.

The Precambrian rocks trend northeast, dip southeast, and contain both isoclinal and open folds. They are cut by minor longitudinal and oblique reverse faults and transverse normal faults. Sims (1958, p. 54) reports that faults within the Precambrian rocks of the Dover district in Morris County have small displacements in contrast to the great faults that bound individual structural blocks. Several sets of vertical or steeply dipping joints occur in the Precambrian rocks. One set is parallel to the regional structure. A second set is transverse to it, and a third set is oblique to the regional structure. The transverse joints are the most abundant and the most prominent set (Sims, 1958, p. 47). Another set of joints is nearly horizontal or may dip gently in any direction and presumably is a result of sheeting due to the release of load by erosion.

The outlier of Paleozoic rocks contains a large syncline which is truncated on the west by a major northeast-trending normal fault which places rocks of Devonian age adjacent to rocks of Precambrian age. The Paleozoic rocks are cut by smaller northeast-trending reverse faults at both Newfoundland and Greenwood Lake. Joint sets in the Paleozoic rocks are parallel, transverse, and oblique to the regional strike of the beds and according to Sims (1958,

p. 48) "probably reflects prominent joint sets in the Precambrian rocks." The transverse joints appear to be the most prominent and apparently control the location of streams that transect Bearfort Mountain.

The Triassic rocks are bounded on the northwest by a major northeast-trending normal fault. In general the Triassic rocks have a monoclinal dip of 10° to 15° NW and contain shallow open folds such as those expressed in the arcuate trend of the outcrop of the Watchung Basalt. Minor north-trending normal faults cut the Triassic rocks and are apparent where they offset the contact between the basalt flows and the Brunswick shale. The Brunswick contains vertical joints. The major joint sets are parallel and transverse to the strike of the beds. Many of the flows of the Watchung Basalt contain prominent columnar structure.

A thorough discussion of the origin of vertical or steeply dipping joints is beyond the scope of this report. In a study of jointing, Hodgson (1961, p. 37) concluded that "systematic joints are produced by tidal forces through a fatigue mechanism and the direction of the joints is considered to be inherited by upward reflection of the joint pattern in pre-existing jointed rocks." The systematic joints in Triassic and Paleozoic rocks in Passaic County have the same basic trends as do the joints in the Precambrian rocks.

GROUND WATER HYDROLOGY

Principles

Water is continually being exchanged in a circulatory pattern between the earth and the atmosphere. In general, the amount of precipitation ultimately determines the amount of water available for man's use. Some of the precipitation that falls on land evaporates where it falls, some is absorbed by plants that later transpire the water back to the atmosphere, some flows overland to streams, and some infiltrates into the ground to become ground water. The ground water is discharged to streams, and streams flow to the oceans where the water can be evaporated back to the atmosphere.

Ground water is the subsurface water in the zone of saturation--the zone in which all the rock voids are filled with water under pressure equal to or greater than atmospheric. The water table is the upper surface of this zone and in Passaic County occurs at depths of 20 to 40 ft (6 to 12 m) below land surface on hilltops and intersects the land surface in valleys where it is contiguous with the upper surface of streams, lakes, swamps, and reservoirs.

In unconsolidated deposits, and in friable consolidated rocks, ground water is stored in and moves through the intergranular openings. Ground water in the consolidated rocks of Precambrian, Paleozoic, and Triassic age occurs in and moves through cleavage planes, joints, fractures, and faults. These openings become fewer and tighter with increasing depth below the land surface but tend to be distributed in an orderly geometric attitude within rock units of homogeneous composition. The openings are better developed and enlarged in some rocks than others; however, the openings form a comparatively small volume in comparison to the volume of the rock as a whole.

The movement of ground-water in the Precambrian igneous and metamorphic rocks and the Paleozoic sedimentary rocks is probably largely in a direction transverse to the regional structure of the beds. Openings along the joint set transverse to the regional structure have probably been selectively enlarged by weathering more than those openings along joints parallel and oblique to the regional structure. The greater weathering of transverse joints is indicated by their greater abundance and prominence and by the dominant east-west alignment (parallel to the direction of dominant jointing) of streams cutting the Precambrian and Paleozoic rocks. A further suggestion that the movement of ground water in the Precambrian and Paleozoic rocks is controlled largely by the transverse joints comes from an analysis of streamflow data of West Brook and Ringwood Creek. West Brook, which traverses the regional structure, has higher flow per square mile than Ringwood Creek which parallels the regional structure. The mean flow for West Brook near Wanaque is 1.94 $(ft^3/s)/mi^2$ (cubic feet per second per square mile) [.0212 $(m^3/s)/km^2$ (cubic metres per second per square kilometre)] and for Ringwood Creek it is 1.65 $(ft^3/s)/mi^2$ [0.180 $(m^3/s)/km^2$]. Differences in low flow, which are composed almost entirely of ground-water discharge, between the two streams are shown in the table below. There is no known variation in thickness, composition, or distribution of the Pleistocene deposits, or difference in precipitation that would account for the higher flow of West Brook.

Stream	Average of the minimum mean discharge for designated number of days [$(ft^3/s)/mi^2$]					
	3	7	14	30	60	90
West Brook near Wanaque	0.123	0.138	0.167	0.215	0.332	0.454
Ringwood Creek near Wanaque	.095	.112	.137	.185	.283	.372

Water-bearing openings in the Brunswick Formation in New Jersey occur in discrete zones controlled by bedding. These tabular aquifers extend downdip for several hundred feet and are continuous along strike for thousands of feet. Hydraulic connection between the aquifers is generally poor. The movement of water in these aquifers under pumping and presumably under natural conditions is preferentially along strike (Vecchioli, 1967, and Vecchioli and others, 1969). Thus, discrete water bearing and nonwater bearing zones in the Brunswick form a series of tabular aquifers and aquitards ranging up to tens of feet thick and dipping to the west at approximately 10 to 15 degrees. The basalt flows that are intercalated with the Brunswick generally act as aquitards.

In Passaic County the ground-water reservoir is a few hundred feet thick and can be visualized as composed of a number of small basins separated by divides which at land surface coincide with surface-water drainage divides.

In the subsurface these ground-water divides do not necessarily descend vertically through the zone of fresh water circulation but may in places become essentially horizontal where they form divides between shallow local flow systems and deeper and larger flow systems. Ground-water flow systems in the county are generally small, the largest underlying probably only a few square miles. No regional ground-water flow system underlies the entire area.

Areal variations occur in the thickness, porosity, and permeability of the rock within the zone of fresh-water flow. These variations are partly the result of changes in the chemistry of the water and its ability to weather and dissolve mineral matter as the water moves through the rocks. In the upland areas, water entering the water table contains dissolved oxygen, carbon dioxide, and humic acids which greatly aid in the weathering of rock. In contrast the water moving along the longest flow paths is alkaline and may be much closer to being in chemical equilibrium with the rock. Variations in thickness, porosity, and permeability may also be the result of areal variations in the rates of movement and volume of water transmitted through the rocks. On hilltops or divides a comparatively small volume of water enters and moves through the secondary openings, thus limiting the amount of weathering. On the other hand comparatively large volumes of water move beneath the flanks of major valleys. Movement of ground water in the valleys is generally upward to discharge. Because it is a discharge area, precipitation that falls on the area cannot enter the system and, therefore; certain forms of the weathering and particularly the oxidation of minerals is precluded.

Water-bearing fractures at different depths below land surface contain water under different hydraulic heads. On stream-drainage divides, hydraulic heads decrease with increasing depth and in major valleys they increase with increasing depth below land surface. In intermediate areas, including minor valleys, there may be reversals in the direction of head change with increasing depth below land surface. Most wells in the consolidated rock penetrate more than one producing fracture or zone of fractures which have different hydraulic heads. As a result, the observed water level in a well is characteristically a composite head and does not indicate the hydraulic head of any single water-producing zone. When a well penetrates separate fracture zones having different hydraulic heads some of the natural flow is short circuited through the well from the fracture having a higher hydraulic head to that having the lower head. A consequence of the internal flow in wells under nonpumping conditions may be the cleaning of openings which were partially sealed during drilling. Some of the variation in well yields noted in Passaic County may in part depend upon which part of the flow system the well penetrates and the consequent effect of internal borehole flow upon the cleaning of water-bearing openings.

In a study of the availability of water in igneous and metamorphic rocks in the southern Piedmont province Legrand and Mundorff (1952) found a relationship between well yields and the topographic location of the well. They found that wells located in draws have the highest yields and progressively smaller yields are found from wells in the following topographic locations: valleys, slopes, flats, and hills. Studies in similar terrains throughout the

New England and Piedmont provinces have in general confirmed the relationship between yields and topographic location of the wells. James (1967) in a study of the availability of water in the Precambrian crystalline rocks of the New Jersey Highlands found the same relationship between well yield and topographic location. Yields of wells penetrating the Precambrian rocks in Passaic County probably bear a similar relationship.

Water-Bearing Properties of the Rocks

The rocks of Passaic County differ greatly in their ability to yield water to wells. Figure 5 shows the frequency distribution of reported yields of wells tapping the major rock units in Passaic County. Difference in well yields between rock units and variations in well yield within a rock unit depend in part upon the hydraulic characteristics--permeability, thickness, and storage coefficient--of the aquifer. For consolidated rocks, these characteristics depend upon the number, size and degree of interconnection of secondary openings which occur along structural features such as joints, faults, cleavage, and bedding. Other factors affecting well yields include; well diameter and depth, degree of well cleaning and development, and the hydraulic continuity of the aquifer with a source of induced recharge from a surface-water body.

Precambrian Rocks

The Precambrian rocks are the major source of ground water for domestic use in the northwestern two-thirds of Passaic County. These rocks generally yield smaller quantities of water to individual wells than do the other major geologic units in Passaic County. Reported yields of wells tapping the Precambrian rocks in Passaic County range from less than 1 to 200 gal/min (gallons per minute) [.06 to 13 l/s (litres per second)]. The highest reported yields are obtained from wells that are located in the larger valleys near streams or large surface-water bodies such as Lake Erskine and Greenwood Lake.

The frequency distributions of reported yields of 415 domestic wells and of 21 public-supply wells are shown in figure 5. The median yield of the domestic wells is 5 gal/min (.32 l/s) and that of the public-supply wells is 30 gal/min (2 l/s).

Depths of wells drilled in Precambrian rocks vary considerably in Passaic County. They depend in part on the cost of well construction and on the quantity of water required for a particular use. Maximum reported depths are about 400 ft (122 m) and minimum depths are about 50 ft (15 m). The average reported depth is 160 ft (49 m). The deepest wells were drilled to obtain large public and industrial supplies; whereas, most of the shallower wells were drilled to obtain only small domestic supplies.

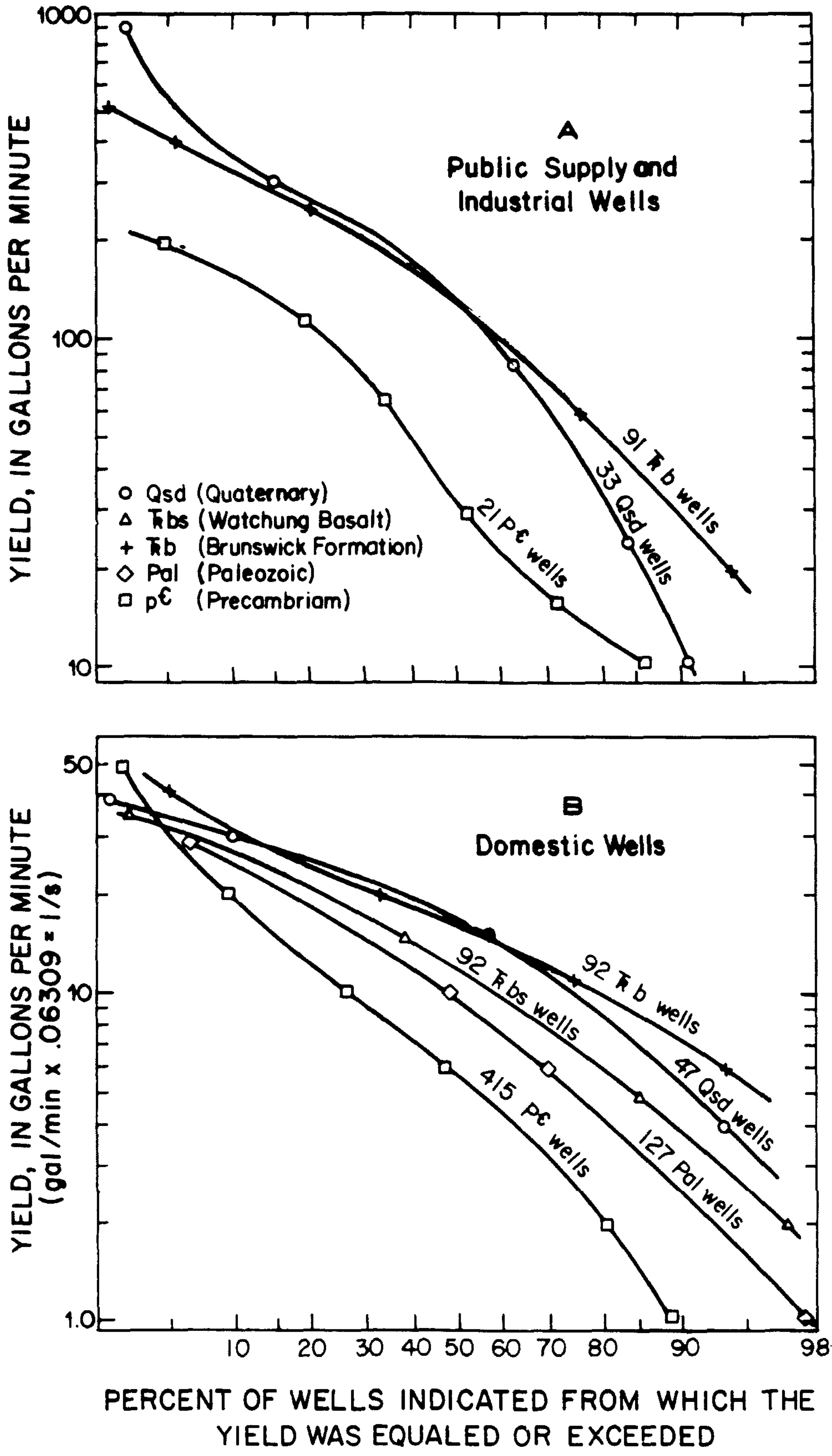


Figure 5.--Graph showing frequency distribution of well yields grouped according to geologic unit.

Paleozoic Rocks

The Paleozoic rocks are utilized primarily for domestic water supplies in Passaic County. Some of the Paleozoic units such as the Kanouse Sandstone, Green Pond Conglomerate, and Hardyston Quartzite (see figure 3) are locally friable and potentially may yield significant quantities of water to properly located wells. Reported yields of wells tapping the Paleozoic rocks in Passaic County range from less than 1 gal/min to 35 gal/min (.06 to 2 l/s). The median reported yield of 127 wells, almost all of which are domestic wells, is 10 gal/min (.63 l/s). The frequency distribution of these well yields is shown in figure 5.

Depths of wells drilled in the Paleozoic rocks in Passaic County range from about 50 ft (15 m) to 400 ft (122 m). The average depth of 32 selected wells listed in table 2 is 150 ft (46 m).

Triassic Rocks

Brunswick Formation

The Brunswick Formation is the most important aquifer in Passaic County. It is the major source of ground water for public supply and industrial use in the county. Reported yields of 91 public supply and industrial wells range from 20 to 510 gal/min (1 to 32 l/s). The median yield is 130 gal/min 8 (l/s) (see figure 5). The median yield of all public supply and industrial wells over 300 ft (91 m) deep is 190 gal/min (12 l/s), and the yield of the deep wells that are 8 in (203 mm) or larger in diameter is 230 gal/min (15 l/s). The higher yields of the larger diameter wells are in part a result of decreased entrance losses to the well and may in part result from better cleaning and development of the well. Most of the high yielding wells are located in valleys in the more industrial areas, in Hawthorne, Paterson, Clifton and Passaic and are in or on the flanks of preglacial valleys containing comparatively thicker unconsolidated deposits. They are thus located in an environment where recharge to the aquifer may be induced. Smaller yields are generally obtained from domestic wells. The median reported yield of 92 domestic wells is 16 gal/min (1 l/s) (see figure 5). These wells have smaller diameters and are shallower and less developed than the public supply and industrial wells. Most domestic wells are between 150 and 250 ft (46 and 76 m) deep; whereas, most public-supply and industrial wells are between 200 and 400 ft (61 and 122 m) deep.

Watchung Basalt

The Watchung Basalt is utilized primarily for domestic water supplies in Passaic County. Reported yields of 92 domestic wells range from less than 1 gal/min (.06 l/s) to 40 gal/min (3 l/s). The median yield is 12 gal/min (.76 l/s). Figure 5 shows the frequency distribution of yields of these domestic wells. Reported yields of nine industrial and commercial wells in Passaic County range from 50 to 180 gal/min (3 to 11 l/s). A few wells in adjacent Essex County have reported yields as high as 400 gal/min (25 l/s) (Nichols, 1968).

Depths of wells tapping the Watchung Basalt range from 30 to 600 ft (9 to 183 m). The average depth of 31 selected wells (table 2) is 250 ft (76 m).

Quaternary Deposits

Stratified deposits of Quaternary age are an important source of ground water for public supply and industrial use in Wanaque and Pompton Lakes and along the western side of Wayne Township. These deposits are major sources of water in adjacent Morris County (Gill and Vecchioli, 1965) and along the Ramapo River in western Bergen County (Vecchioli and Miller, 1974). The deposits in Passaic County have not, for the most part, been extensively explored and are potentially an important source of ground water for future development. Interpretation of the thickness and probable lithology of stratified and unstratified deposits (fig. 4) provides an initial guide to locate probable stratified deposits of sufficient areal extent and thickness to supply suitable quantities of water to wells.

Stratified deposits of Quaternary age generally yield larger quantities of water to individual wells than do the other major geologic units in Passaic County. Reported yields of wells range from 4 to 920 gal/min (.25 to 58 l/s). The frequency distribution of reported yields of 33 public supply and industrial wells and of 47 domestic wells is shown in figure 5. The median yields of the domestic wells are 16 gal/min (1 l/s) and that of the public supply and industrial wells are 130 gal/min (8 l/s).

The maximum depths of wells tapping Quaternary deposits are limited by the thickness of the deposits. Reported depths of 23 wells (table 2) range from 22 to 170 ft (7 to 52 m). Most of the wells are between 50 and 125 ft (15 and 38 m) deep.

Quality of Water

All natural water contains some impurities. Even rainfall is not chemically pure. It absorbs dust and also gases, such as carbon dioxide, from the atmosphere. Water in passing through the atmosphere and over and through the soil and underlying rocks acquires impurities as either dissolved or suspended matter. The physical and chemical nature of the dissolved or suspended matter determines the natural quality of the water and its suitability for any particular use.

The nature and concentration of impurities in water depend chiefly on the chemical composition of the soils and underlying rocks with which the water comes in contact, and upon the length of time that the water and rock have been in contact with each other. Generally, the longer water remains in contact with the soil and rock, the more dissolved matter it will contain. Suspended matter which consists largely of sediment derived from erosion at the land surface is not an important constituent of ground water.

Man's activities may impair the natural water quality. Disposal of industrial wastes and domestic sewage can pollute water supplies. Water can also pick up matter that man has added to the environment such as that found in fertilizers, pesticides, and compounds used in snow and ice removal along highways. Dissolved minerals in natural water may be either harmful or beneficial so it is important to know the kind and concentration of minerals in our water supply and how they affect the use of the water.

Chemical constituents most commonly tested for in water are silica, iron, manganese, calcium, magnesium, sodium, potassium, bicarbonate, sulfate, chloride, fluoride, and nitrate. Concentrations of these elements are reported in this report in milligrams per litre (mg/l). Other properties of water that influence its use and degree of treatment are dissolved solids, hardness, specific conductance, pH, and temperature. The chemical composition and physical character of ground-water samples from Passaic County are shown by the results of analyses of samples given in table 3.

Standards of water quality vary considerably according to the intended use. The New Jersey Department of Health (1967) has established standards for maximum concentrations of many constituents in water that are to be used for potable purposes. The recommended maximum concentrations of certain specific chemical substances in New Jersey's potable water-supply systems are listed below:

Constituent	Recommended maximum (milligrams per litre)
Chloride (Cl)	250
Fluoride (F)	1.5
Hardness (as $CaCO_3$)	150
Iron (Fe)	0.3
Manganese (Mn)	0.05
Nitrate (NO_3)	30
Sodium (Na)	50
Sulfate (SO4)	250
Total dissolved solids	500

The N.J. Health Department further states that . . "these chemical substances should not be present in a water intended for potable purposes in excess of . . . the listed concentrations. Their presence may constitute grounds for the rejection of the supply if, in the opinion of the Department such substances, either singly or in combination, are present in such concentrations as would render the water unduly corrosive, unpalatable, hazardous to the consumer, or aesthetically objectionable." Most of the naturally occurring ground water in Passaic County is of better quality than the New Jersey potable standards except for high concentrations of iron, hardness, and dissolved solids in some areas.

Excessive concentrations of iron, 0.3 mg/l or more, cause a reddish-brown staining on laundry and bathroom fixtures and gives the water an astringent taste. Corrosion of metallic surfaces such as copper piping also causes staining; for compounds of copper, it generally leaves a bluish stain.

Soft water and hard water are common terms in describing the quality of water supplies. Very soft water generally causes corrosion of metallic surfaces; whereas, hard water uses excessive amounts of soap in household laundering, also leaves a light scum in wash tubs, and is absorbed into laundered clothing. The hardness of water classification used in this report is as follows:

Hardness description	Range (milligrams per litre)
Very soft	0 - 30
Soft	31 - 60
Moderately hard	61 - 120
Hard	121 - 180
Very Hard	More than 180

The hardness of ground water studied in this investigation from all the different aquifers in Passaic County ranged from soft to very hard (34 mg/l to 540 mg/l).

Standards for water quality for industrial uses differ widely. Most industrial processes require water containing no more than 500 mg/l dissolved solids. Almost all the ground water used in Passaic County contains less than 500 mg/l dissolved solids. Water used for cooling may contain more than 500 mg/l dissolved solids, but should have a relatively constant and cool temperature. Temperatures of ground water are nearly constant throughout the year and generally range from about 10° to 15°C (Celsius) in most areas of Passaic County.

The quality of ground water in Passaic County varies considerably from one aquifer to another and from place to place within the same aquifer. These variations can be attributed mainly to (1) differences in the composition of the rocks within the aquifers, (2) the pattern of ground-water movement from recharge to discharge areas, and (3) the length of time water is in contact with the rocks and the depth of water circulation in each aquifer system.

Water from the Precambrian rocks ranges from soft to moderately hard (34 to 104 mg/l) and is low in dissolved solids (66 to 159 mg/l). (See table 3). Chloride concentrations in four samples ranged from 2.4 to 11 mg/l. Most of the water is slightly alkaline with an average pH of about 7.3. The relatively low mineral content of water from the Precambrian rocks is due mainly to the highly resistant nature of the rocks to weathering.

Only one sample of water was obtained from a well penetrating the Paleozoic rocks (Well WM-48). The water quality of this sample is quite similar to that from the Precambrian rocks.

The quality of water from the Quaternary deposits in Passaic County appears to be very good as indicated by the results of the two analyses

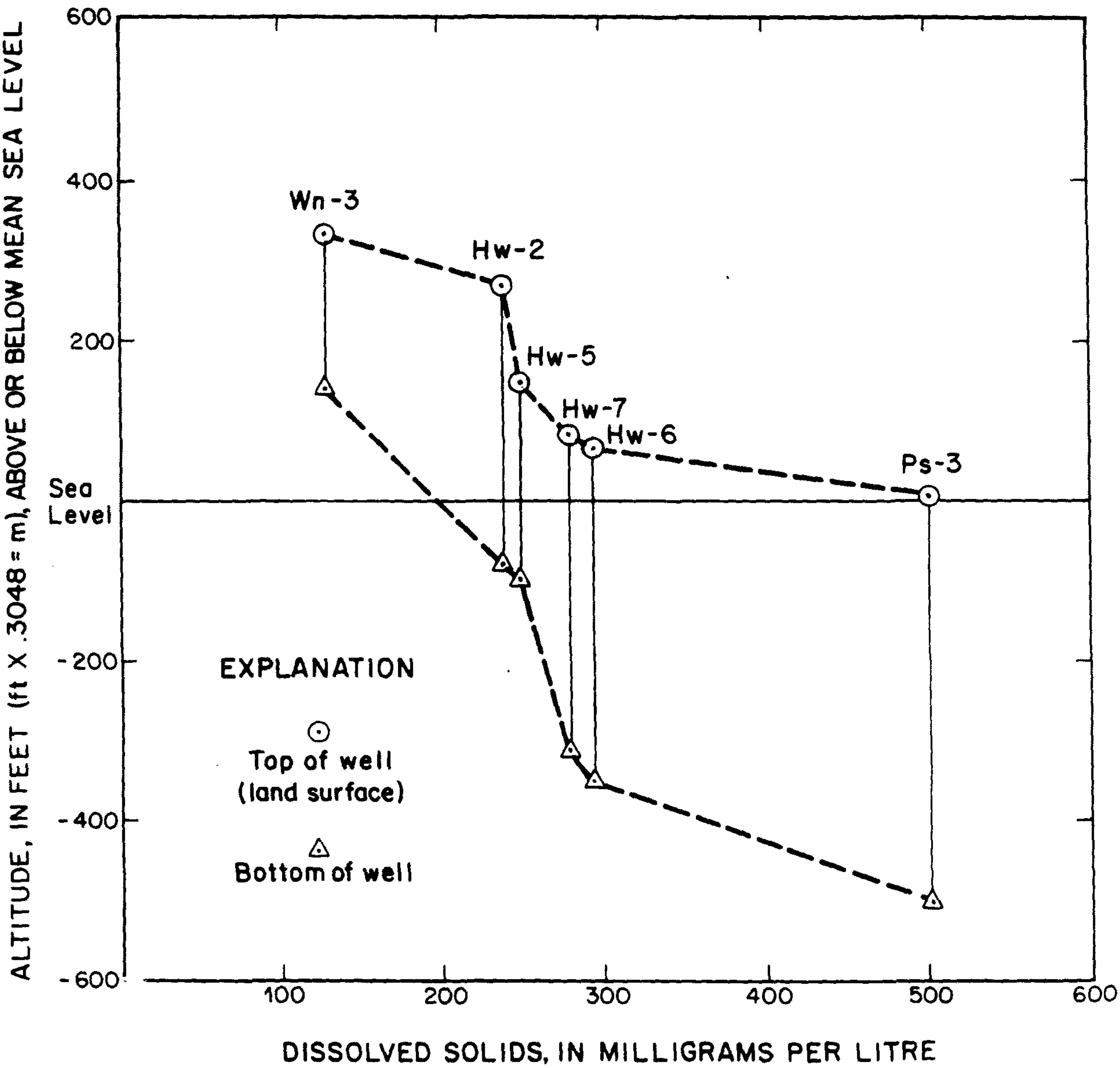
(Wells Wn-2 and Wn-8) in table 3. The water is only moderately hard (65 and 83 mg/l) and is low in dissolved solids (122 and 133 mg/l). It ranges from slightly acidic (pH 6.5) to slightly alkaline (pH 7.6). Although supporting data are not presently available, it is believed that the quality of water from the Quaternary deposits is similar to that in the underlying rocks. Hence, less mineralized and softer water would probably be found in the stratified drift underlain by the Precambrian rocks than in the stratified drift underlain by the Brunswick Formation.

The quality of water in the Brunswick Formation differs from that in the other aquifers in Passaic County. It is generally much more mineralized and its quality varies considerably more from place to place. Dissolved solids in 11 samples listed in table 3 range from 129 to 563 mg/l and average 314 mg/l. However, as much as about 16,000 mg/l of dissolved solids have been reported by Cook (1885, p. 116).

In general the water in the Brunswick is less mineralized in the recharge areas at higher altitudes and more mineralized in discharge areas at low altitudes. Figure 6 shows the general relation of altitudes of tops and bottoms of wells to dissolved solids from typical wells in the Brunswick Formation in Passaic County. Well Wn-3 located near Lionshead Lake in northern Wayne Township is at an altitude of 340 ft (104 m) above sea level and has the lowest dissolved solids--129 mg/l. Wells Hw-2, Hw-5, Hw-6, and Hw-7 are located entirely in Hawthorne Borough on the valley flanks of Goffle Brook. Well Ps-3 in the City of Passaic is at the lowest altitude, and the dissolved solids content is over 500 mg/l.

Water from the Brunswick Formation probably becomes more mineralized with increasing depths below land surface. Increasing mineralization of the water with increasing depth was reported as early as 1885 by Cook (1885, p. 115-117) for a test well drilled to a depth of 2,100 ft (640 m) in Paterson, N. J. During drilling of this well, water samples were collected at about 900 ft (274 m), 1,700 ft (518 m) and 2,050 ft (625 m) below land surface and contained about 230 mg/l, 6,000 mg/l and 16,000 mg/l of dissolved solids, respectively. The water at 1,700 ft (518 m) was mostly "sulfate of lime" while the water at 2,050 ft (625 m) was "strongly saline" and contained "408.46 grains per gallon of chloride of sodium" (about 6,900 mg/l of NaCl). This well is located above the present day tidal area of the Passaic River. The highly mineralized water found at depth is not related to present-day salt-water intrusion but, more likely, is characteristic of a residual saline water. Highly mineralized water probably occurs at similar depths elsewhere in the eastern part of the county.

Water from the Brunswick Formation is moderately hard to very hard. The average hardness for 12 of the 13 analyses (one analysis, well Cl-12, is discussed separately below) in table 3 is 199 mg/l, and the minimum and maximum values are 89 and 340 mg/l, respectively. As the recommended maximum hardness of potable water by the New Jersey Department of Health is 150 mg/l, much of the ground water from the Brunswick used for potable supplies should be treated to reduce its hardness. The hardness is due mainly to the solution of calcium and magnesium sulfate minerals in the rocks. Gypsum (calcium sulfate), a highly soluble mineral, has been observed in cuttings from wells in the Triassic rocks (Herpers and Barksdale, 1951,



igure 6.--Relation of dissolved solids to the altitudes of wells tapping the Brunswick formation.

p. 37) and undoubtedly contributes to the hardness of the water.

In some areas, particularly the more industrialized and urbanized parts of the county, the natural quality of water in the Brunswick Formation has been contaminated by man's activities. For example, water from a well in Clifton (Well Cl-12) has been contaminated by industrial waste water from nearby seepage pits. The water contains unusually high concentrations of iron, 25 mg/l; sulfate, 435 mg/l; and hardness, 540 mg/l. This water is acidic (pH 5.9). The low pH, together with a high reported carbon dioxide concentration, make this water excessively corrosive. The exceptionally high concentration of iron in this water is probably due to corrosion of pipes. Although this water is suitable for industrial cooling purposes, it is not suitable for potable supply according to the New Jersey Department of Health Standards. With continued use of this type of highly corrosive water, pipes and other plumbing fixtures would eventually have to be repaired or replaced.

WATER USE

Water use in Passaic County from both surface- and ground-water supplies averaged about 106 Mgal/d (million gallons per day) [5 m^3/s (cubic metres per second)] in 1965 (N. J. Division of Water Resources, (personal commun., 1969). Of this total, demands for public supply accounted for 76 Mgal/d (3 m^3/s); industrial use, 27 Mgal/d (1 m^3/s); and irrigation, 3.0 Mgal/d (.13 m^3/s). Total per capita use averaged 247 gal/d (gallons per day) [935 l/d (litres per day)]. Because of insufficient data, ground water use for all purposes could not be determined for this report. However, only a very small portion of the County's total requirements is presently derived from ground-water sources; probably between 5 and 10 percent of the total demand.

The major purveyors of surface water for use in Passaic County are: (1) Passaic Valley Water Commission which serves most of the public-supply requirements for Clifton, Little Falls, Passaic, Paterson, Prospect Park, and part of West Paterson; (2) Butler Water Bureau which serves Bloomingdale and Pompton Lakes; (3) Haledon Water Department which serves both Haledon and North Haledon; (4) Newark-Pequannock water systems which serve most of Wayne Township. The major purveyors of ground water for public supply and their monthly and annual pumpage in 1968 are shown in table 1. In 1968, ground-water withdrawals for public supply averaged 4.39 Mgal/d (.19 m^3/s). About 80 percent of public supply withdrawals come from wells tapping the Brunswick Formation in Hawthorne and Wayne Townships in the more developed southern part of the county.

Seasonal variations in the total use of ground water can also be seen in table 1. Maximum monthly pumpage for the public supplies averaged about 140 percent greater during July and August 1968 than during February and March.

Table 1.--Use of ground water for public supply in Passaic County, N.J.--1968
(in million gallons per day)

(Data from records of New Jersey Division of Water Resources)

	January	February	March	April	May	June	July	August	September	October	November	December	Annual Average
Hawthorne Water Dept.	2.70	2.79	2.82	3.18	3.26	3.55	3.62	4.19	3.47	3.10	3.09	3.26	3.27
Wanaque Water Dept.	.62	.48	.41	.45	.69	.75	.87	.76	.58	.64	.79	.67	.65
Wayne Twp. Water Dept.	.22	.27	.28	.28	.28	.27	.27	.24	.23	.27	.26	.19	.26
West Milford Twp. Munic. Util. Auth.*	.04	.04	.04	.06	.07	.08	.12	.12	.10	.08	.06	.07	.07
Ringwood Boro (Windbeam Water Co.)	.15	.16	.15	.15[e/]	.17[e/]	.16[e/]	.17[e/]	.16[e/]	.15[e/]	.15[e/]	.15[e/]	.15[e/]	.14[e/]
Totals	3.73	3.74	3.70	4.12	4.47	4.81	5.05	5.47	4.53	4.24	4.35	4.34	4.39

[e/] Estimated from 1967 data

* Additional unknown quantities of ground water are supplied from about 40 low-producing wells to small communities throughout West Milford Township by about 27 private water companies.

Ground water, derived from wells, is utilized to some extent in all municipalities in the county. However, in the more suburban and rural areas, almost all water supply is from wells. In these less populated areas, wells are used for industiral, commercial, residential, and rural water requirements. In West Milford Township, for example, ground water is supplied to small communities by about 27 private water companies pumping from about 40 wells. Most of these wells tap aquifers in rocks of Precambrian and Paleozoic age and produce small to moderate quantities of water. Ringwood is supplied by many low yielding wells tapping Precambrian and Quaternary rocks.

Trends in ground-water pumpage by the major public-supply companies from 1951 to 1968 are shown in figure 7. Ground water pumpage has increased from 2.1 Mgal/d (.09 m^3/s) in 1951 to 4.39 Mgal/d (.19 m^3/s) in 1968.

Ground water pumpage, as well as total water use, is expected to increase substantially in the next 10 years. Future use will depend largely on an increasing population and an expanding economy. According to the N.J. Division of Water Resources (personal commun., 1969) the total water demand in Passaic County is expected to increase from 106 Mgal/d (5 m^3/s) in 1965 to 142 Mgal/d (6 m^3/s) in 1980. Public supplies are expected to account for about 70 percent of the total demands. Suburban areas and relatively undeveloped rural areas will show the largest increases in population with corresponding increases in water demands. For example, the population from 1960 to 1969 is estimated to have increased about 62 percent in Wayne Township, 80 percent in Ringwood, and 63 percent in West Milford (N.J. Bureau of Research and Statistics, 1970). In these areas ground water will play an important role in supplying the future water demands of the county.

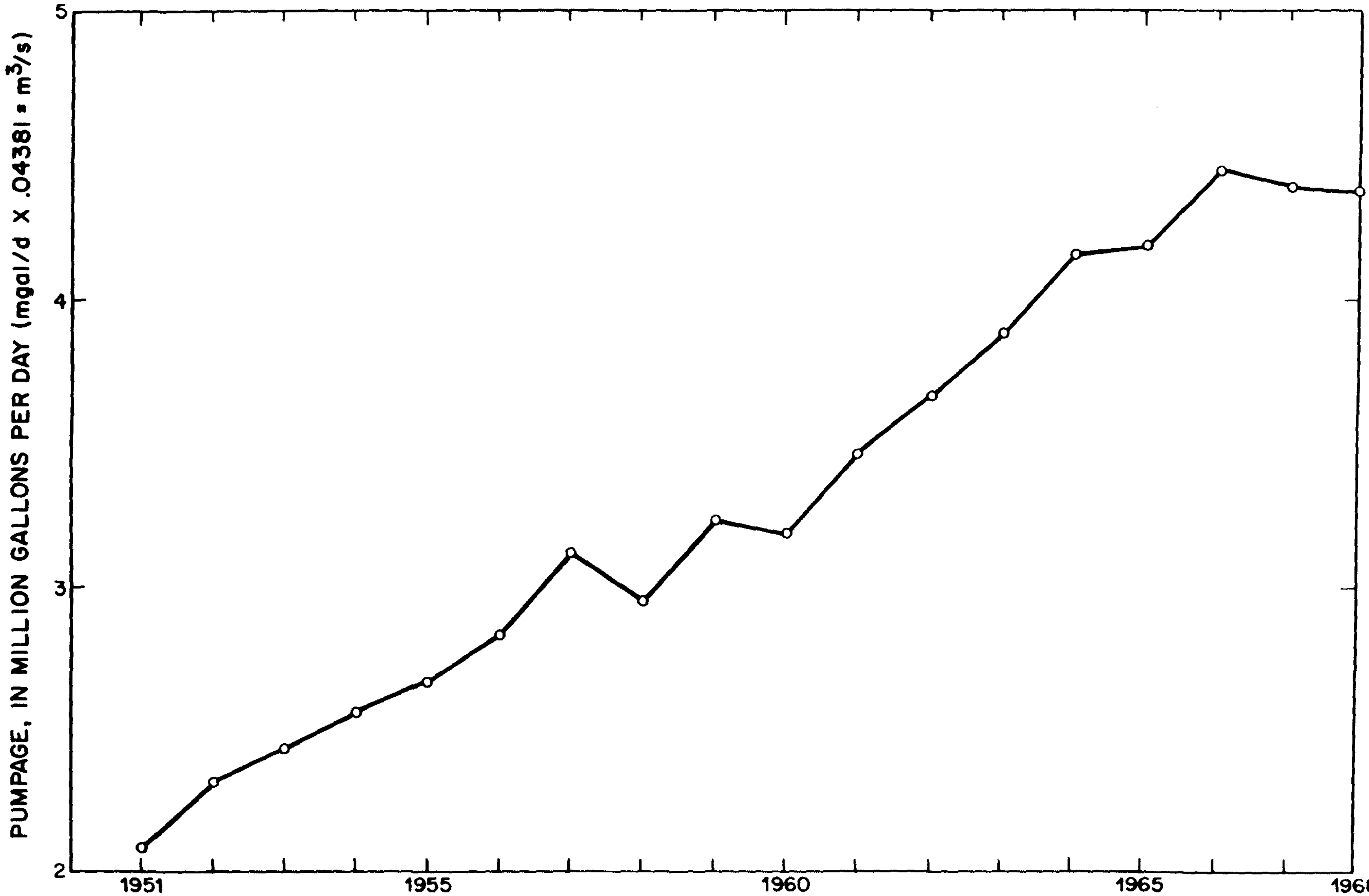


Figure 7. - - Ground-water pumpage by major public-supply companies in Passaic County, 1951-68.

SUMMARY AND CONCLUSIONS

Passaic County, located in north central New Jersey is shaped roughly like an hour glass with the top to the northwest and the bottom to the southeast. The northwestern two thirds of the county is in the New Jersey Highlands and is underlain largely by gneiss of Precambrian age and an outlier of folded sedimentary rocks of Paleozoic age. The Highlands area is largely developed as a watershed for surface water supply; approximately one quarter of the land area used for this purpose is municipally owned.

The southeastern one-third of the county is in the Piedmont Lowland and is underlain by the Brunswick Formation and the Watchung Basalt of Triassic age. The Brunswick Formation consists of alternating beds of reddish-brown sandstone and mudstone. Conglomerate occurs locally along the northwestern border of the area underlain by the Newark Group and near the base of the lowest Watchung Basalt. The Brunswick Formation forms broad lowlands that are interrupted by First and Second Watchung Mountains and Packanack Mountain which are underlain by Watchung Basalt.

Bedrock in Passaic County is largely concealed beneath unconsolidated deposits genetically related to the continental ice sheets that overran the county during the Wisconsin Stage of the Quaternary Period. These deposits are thin to absent on hills and are thickest in present-day valleys. Maximum known thickness is about 220 ft (67 m) in the valley of the Pequannock River near Pompton Lakes.

Ground water occurs in the intergranular openings of unconsolidated stratified deposits and in joints, fractures, cleavage plans, and faults in consolidated rocks.

Water bearing openings in the Brunswick Formation occur in discrete zones controlled by bedding. The movement of water within these zones is preferentially along strike and hydraulic connection between water-bearing zones is generally poor. The movement of water in the Precambrian and Paleozoic rocks is largely transverse to the regional strike along joints which have been selectively enlarged by weathering.

The Brunswick Formation is the most important aquifer in Passaic County. It is the major source of ground water for public supply and industrial use in the county. Reported yields of public supply and industrial wells range from 50 to 510 gal/min (3 to 32 l/s), and the median yield is 130 gal/min (8 l/s). The median yield of all the public supply and industrial wells, which were drilled to depths of 300 ft (91 m) or greater, is 190 gal/min (12 l/s) and 230 gal/min (15 l/s) for those deep wells which were 8 in (203 mm) or larger in diameter. The deep wells of large diameter probably represent reasonable tests of the maximum yield available for their specific locations. The median reported yield of domestic wells is 16 gal/min (1 l/s). Most domestic wells are 150 to 250 ft (46 to 76 m) deep; whereas, most public supply and industrial wells are 200 to 400 ft (61 to 122 m) deep.

Crystalline rocks of Precambrian age are the major source of ground water for domestic use in the northwestern two-thirds of Passaic County. Reported well yields range from 1 to 200 gal/min (.06 to 13 l/s). The median reported yield of domestic wells is 5 gal/min (.32 l/s) and that of public-supply wells is 30 gal/min (2 l/s). The highest yields are obtained from wells located in the larger valleys near streams or large lakes.

Rocks of Paleozoic age and the Watchung Basalt of Traissic age are utilized primarily for domestic water supplies in Passaic County. Reported yields of wells tapping the Paleozoic rocks range from less than 1 to 35 gal/min (.06 to 2 l/s) and the median yield is 10 gal/min (.63 l/s). Reported yields of domestic wells tapping the Watchung Basalt range from less than 1 to 40 gal/min (.06 to 3 l/s) and the median yield is 12 gal/min (.75 l/s). However, reported yields of nine industrial and commercial wells in the basalt range from 50 to 180 gal/min (3 to 11 l/s), and a few wells in adjacent Essex County have reported yields as high as 400 gal/min (25 l/s).

Unconsolidated stratified deposits of Quaternary age are an important source of ground water for public supply and industrial use in parts of Passaic County. These deposits are major sources of water in adjacent Morris County and in western Bergen County. They have not been extensively explored in Passaic County but are potentially an important source of ground water for future development. Reported yields of wells tapping the stratified deposits range from 4 to 920 gal/min (.25 to 58 l/s). The median reported yield of domestic wells is 16 gal/min (1 l/s) and that of public supply and industrial wells is 130 gal/min (8 l/s). Depths of wells depend upon the thickness of the deposits. Reported depths range from 22 to 170 ft (7 to 52 m).

The quality of ground water in Passaic County varies from one aquifer to another and from place to place within the same aquifer. Water from the Precambrian rocks is soft to moderately hard (34 to 104 mg/l) and is low in dissolved solids (66 to 159 mg/l). Water from only one well tapping the Paleozoic rocks has been analyzed. It is similar in quality to water from the Precambrian rocks. Water from two wells tapping the Quaternary deposits is moderately hard (65 and 83 mg/l) and has dissolved solids contents of 122 and 133 mg/l.

Water from the Brunswick Formation is moderately hard to very hard (89 to 540 mg/l). The hardness is due mainly to solution of calcium and magnesium sulfate minerals (such as gypsum) in the rocks. The dissolved-solids content ranges from 129 to 563 mg/l. More highly mineralized water occurs at depth in the Brunswick Formation. This is indicated by an analysis of water which contained 16,000 mg/l dissolved solids at a depth of 2,050 ft (625 m) in a well in Paterson. In general, water in the Brunswick is less mineralized in recharge areas at higher altitudes and more mineralized in discharge areas at lower altitudes.

Water use from both surface and ground-water supplies in Passaic County averaged about 106 Mgal/d (5 l/s) in 1965. Ground water probably accounts for 5 to 10 percent of this total. Ground-water pumpage by the major public-supply companies in the county has increased from 2.1 Mgal/d (.09 l/s) in 1951 to 4.39 Mgal/d (.19 l/s) in 1968. About 80 percent of the 4.39 Mgal/d (.19 l/s) was from wells tapping the Brunswick Formation in the southern part of the county.

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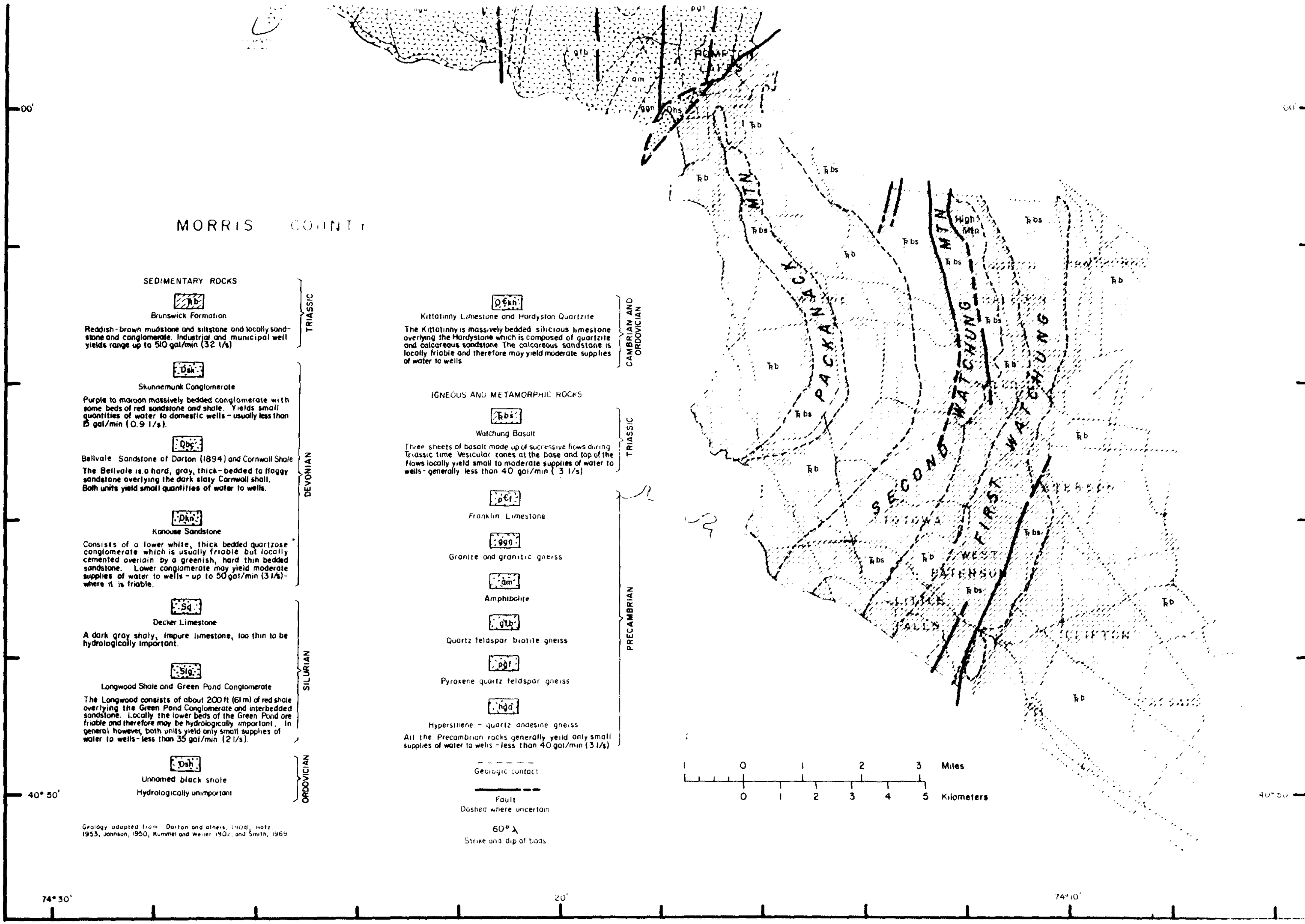
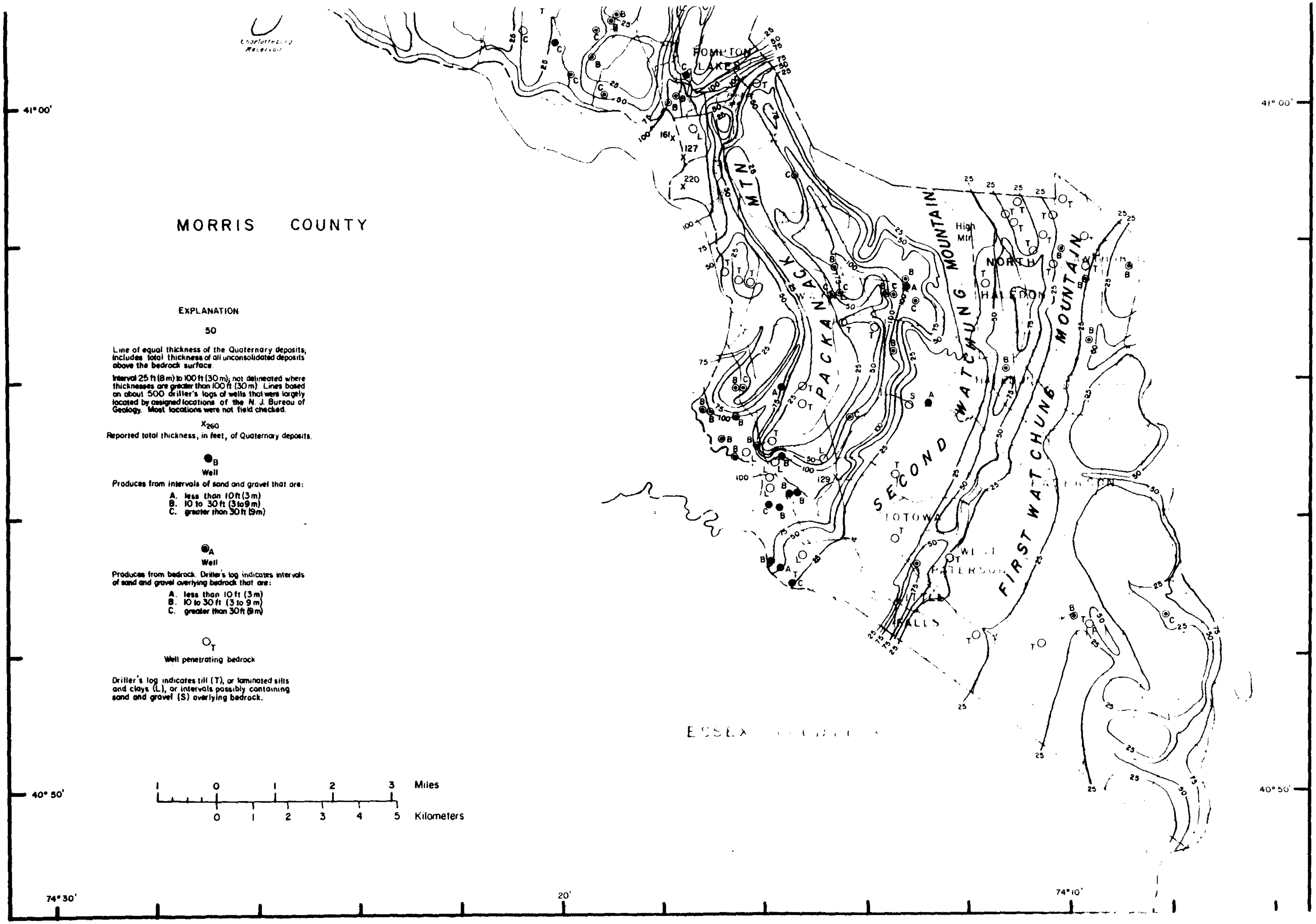

MORRIS COUNTY
SEDIMENTARY ROCKS
Rb
Brunswick Formation
Reddish-brown mudstone and siltstone and locally sandstone and conglomerate. Industrial and municipal well yields range up to 510 gal/min (32 l/s)
TRIASSIC
Dsk
Skunnemunk Conglomerate
Purple to maroon massively bedded conglomerate with some beds of red sandstone and shale. Yields small quantities of water to domestic wells - usually less than 15 gal/min (0.9 l/s).
Dbc
Bellvale Sandstone of Darton (1894) and Cornwall Shale
The Bellvale is a hard, gray, thick-bedded to flaggy sandstone overlying the dark slaty Cornwall shall. Both units yield small quantities of water to wells.
Dkn
Kanouse Sandstone
Consists of a lower white, thick bedded quartzose conglomerate which is usually friable but locally cemented overlain by a greenish, hard thin bedded sandstone. Lower conglomerate may yield moderate supplies of water to wells - up to 50 gal/min (3 l/s) - where it is friable.
DEVONIAN
Sd
Decker Limestone
A dark gray shaly, impure limestone, too thin to be hydrologically important.
Slg
Longwood Shale and Green Pond Conglomerate
The Longwood consists of about 200 ft (61 m) of red shale overlying the Green Pond Conglomerate and interbedded sandstone. Locally the lower beds of the Green Pond are friable and therefore may be hydrologically important. In general however, both units yield only small supplies of water to wells - less than 35 gal/min (2 l/s).
SILURIAN
Osh
Unnamed black shale
Hydrologically unimportant
ORDOVICIAN
O€kh
Kittatinny Limestone and Hardyston Quartzite
The Kittatinny is massively bedded silicious limestone overlying the Hardystone which is composed of quartzite and calcareous sandstone The calcareous sandstone is locally friable and therefore may yield moderate supplies of water to wells
CAMBRIAN AND ORDOVICIAN
IGNEOUS AND METAMORPHIC ROCKS
Rbs
Watchung Basalt
Three sheets of basalt made up of successive flows during Triassic time Vesicular zones at the base and top of the flows locally yield small to moderate supplies of water to wells - generally less than 40 gal/min (3 l/s)
TRIASSIC
p€f
Franklin Limestone
ggn
Granite and granitic gneiss
am
Amphibolite
gfb
Quartz feldspar biotite gneiss
pqf
Pyroxene quartz feldspar gneiss
hqa
Hypersthene - quartz andesine gneiss
All the Precambrian rocks generally yeild only small supplies of water to wells - less than 40 gal/min (3 l/s)
PRECAMBRIAN
Geologic contact
Fault
Dashed where uncertain
60° λ
Strike and dip of beds
Geology adapted from Darton and others, 1908, Hotz, 1953, Johnson, 1950, Kummel and Weller 1902, and Smith, 1969
0 1 2 3 Miles
0 1 2 3 4 5 Kilometers
PACKANACK MTN
SECOND WATCHUNG MTN
FIRST WATCHUNG
High Mtn
TOTOWA
WEST PATERSON
LITTLE FALLS
CLIFTON
POMPTON
40° 50'
74° 30'
20'
74° 10'



Base map adapted from N J State

REFERENCE NO. 4

PRELIMINARY ASSESSMENT
OFF SITE RECONNAISSANCE
INFORMATION REPORTING FORM

Date: MAY 9, 1989

Site Name: SERVOMETER CORP TDD: 02-8904-65

Site Address: 501 LITTLE FALLS ROAD
Street, Box, etc.

CEDAR GROVE
Town

ESSEX
County

NEW JERSEY
State

NUS Personnel:

Name	Discipline
P. SOLINSKI	METEOROLOGIST
J. MAYO	ENVIRONMENTAL SCIENTIST

Weather Conditions (clear, cloudy, rain, snow, etc.):
Cloudy Calm winds

Estimated wind direction and wind speed: Calm

Estimated temperature: 65-70

Signature: Philip Solinski Date: 5/9/89

Countersigned: J. Mayo Date: 5/10/89

PRELIMINARY ASSESSMENT

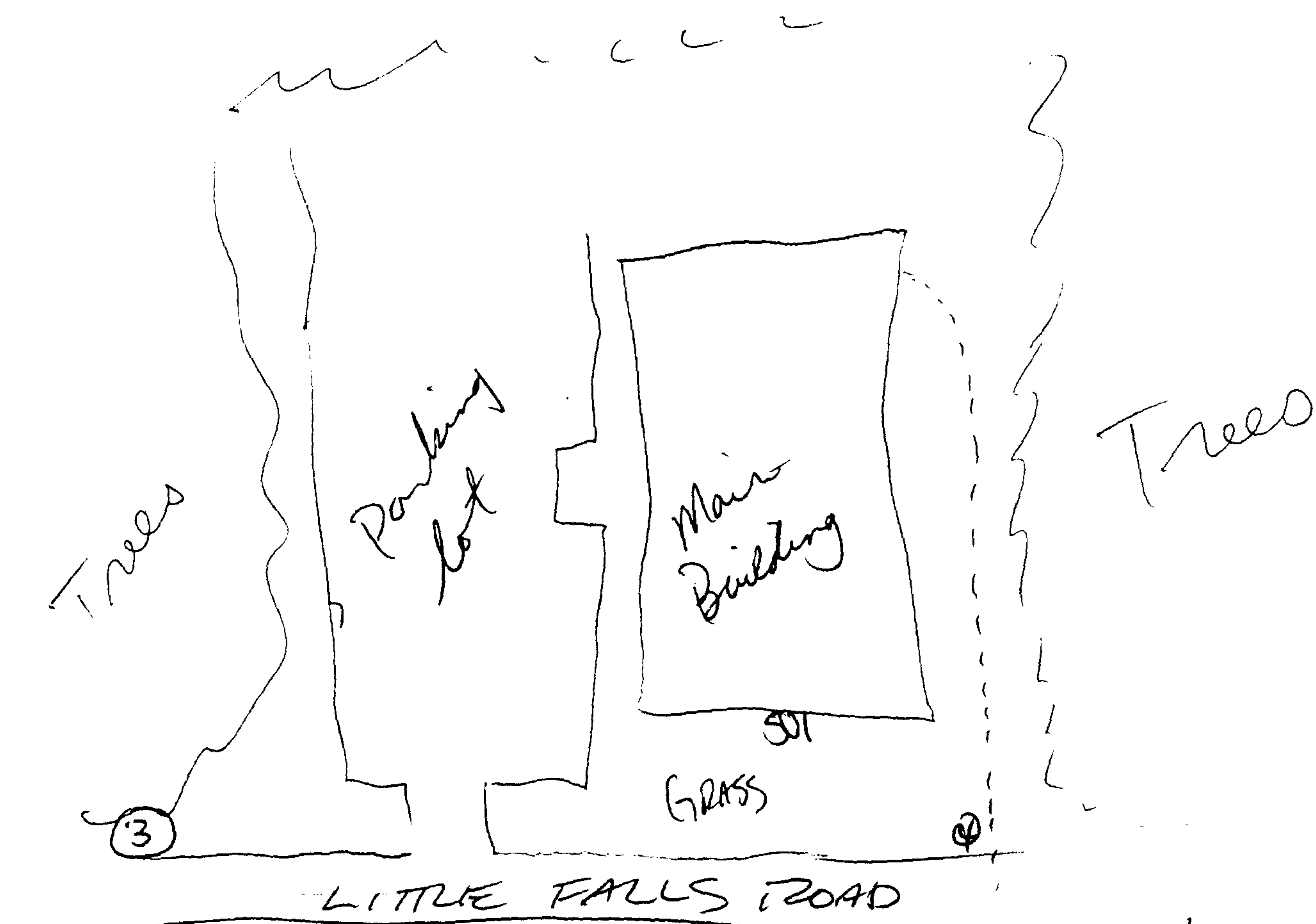
INFORMATION REPORTING FORM

Date: 5/9/89

Site Name: SERVOMETER CORP TDD: 02-8904-65

Site Sketch:

Indicate relative landmark locations (streets, buildings, streams, etc.).
Provide locations from which photos are taken.



5 Signature: Philip Solinski Date: 5/9/89

Countersigned: [illegible] Date: 5/18/89

= Flow - Peckman River

PRELIMINARY ASSESSMENT

INFORMATION REPORTING FORM

Date: 5/9/89

Site Name: SBRWMETER CORP TDD: 02-8904-65

Notes (Periodically indicate time of entries in military time):

1425 Arrive at site
- Site is active
- Site is not fenced
- surrounding properties covered with vegetation (trees)
- No signs of stressed vegetation

1430 - Picture 1P3 + 1S3 taken, 1P4 + 1S4
- Area of site is flat, slight slope < 3% down towards river.
- Distinct odor of sewage ~~em~~ coming from river
- discharge pipe not visible from road

1435 - Chief of operations is curious about our presence. It is explained that we work for EPA as subcontractors. J. Mayo gives business card. also gives ~~an~~ Amy Brochu's ~~as~~ name as contact.

Signature: Philip Soluhin Date: 5/9/89
Countersignature: J Mayo Date: 5/18/89

PRELIMINARY ASSESSMENT

INFORMATION REPORTING FORM

Date: 5/9/89

Site Name: SERVOMETER TDD: 02-8904-65

Notes (Cont'd):

1438 Picture of Peckman River taken looking south. River is not visible from road. River flows from south to north

Attach additional sheets if necessary. Provide site name, TDD number, signature, and countersignature on each.

Signature: Philip Solick Date: 5/9/89

Countersignature: J Mayer Date: 5/18/89

PRELIMINARY ASSESSMENT

INFORMATION REPORTING FORM

Date: 5/9/89

Site Name: SERVOMETER CORP TDD: 02-8904-65

Photolog:

Frame/Photo Number	Date	Time	Photographer	Description
153/1P-3	5/9/89	1430	P. SOLINSKI	looking southeast at site
15-4/1P-4	5/9/89	1431	P. SOLINSKI	looking east at drainage path
15-5/1P-5	5/9/89	1438	P. SOLINSKI	looking south at Peekman River

Attach additional sheets if necessary. Provide site name, TDD number, signature, and countersignature on each.

Signature: Philip Solinski Date: 5/9/89

Countersignature: [signature] Date: 5/18/89

REFERENCE NO. 5

Date: ______
Company
By: ______
Date: ______
Contractor
By: ______
Date: ______

[FR Doc. 84-1452 Filed 1-23-84; 8:45 am]
BILLING CODE 6500-50-MIA

[OW-FRL-2460-3]

Brunswick Shale and Sandstone Aquifer of the Ridgewood Area, New Jersey; Final Determination

AGENCY: U.S. Environmental Protection Agency.

ACTION: Notice.

SUMMARY: Pursuant to Section 1424(e) of the Safe Drinking Water Act, the Administrator of the U.S. Environmental Protection Agency (EPA), has determined that the Brunswick Shale and Sandstone Aquifer, underlying the Ridgewood Area, is the sole or principal source of drinking water for Ridgewood, Midland Park, Glen Rock, and Wyckoff, New Jersey, and that the aquifer, it contaminated, would create a significant hazard to public health. As a result of this action, Federal financially assisted projects constructed in the Ridgewood Area and its streamflow source zone (upstream portions of Ho Ho Kus Brook and Saddle River Run drainage basins) will be subject to EPA review to ensure that these projects are designed and constructed so that they do not create a significant hazard to public health.

ADDRESSES: The data on which these findings are based are available to the public and may be inspected during normal business hours at the U.S. Environmental Protection Agency, Water Supply Branch, 26 Federal Plaza, New York, New York 10278.

FOR FURTHER INFORMATION CONTACT: Damina J. Duda, Water Supply Branch, 26 Federal Plaza, New York, New York 10278 (212) 264-1800.

SUPPLEMENTARY INFORMATION: Notice is hereby given that pursuant to Section 1424(e) of the Safe Drinking Water Act (42 U.S.C., 300f, 300h-3(e), Pub. L. 93-523), the Administrator of the U.S. Environmental Protection Agency (EPA) has determined that the Brunswick Shale and Sandstone aquifer of the Ridgewood Area is the sole or principal source of drinking water for Ridgewood, Midland Park, Glen Rock, and Wyckoff, New Jersey. Pursuant to Section 1424(e), Federal financially assisted projects constructed in the Ridgewood Area and its streamflow source zone (upstream portions of Ho Ho Kus Brook, and

Saddle River Run drainage basins) will be subject to EPA review.

I. Background

Section 1424(e) of the Safe Drinking Water Act state:

(e) If the Administrator determines, on his own initiative or upon petition, that an area has an aquifer which is the sole or principal drinking water source for the area and which, if contaiminated, would create a significant hazard to public health, he shall publish notice of that determination in the Federal Register. After the publication of any such notice, no commitment for Federal financial assistance (through a grant, contract, loan guarantee, or otherwise) may be entered into for any project which the Administrator determines may contaminate such aquifer through a recharge zone so as to create a significant hazard to public health, but a commitment for Federal financial assistance may, if authorized under another provision of law, be entered into to plan or design the project to assure that it will not so contaminate the aquifer.

On July 4, 1979, the Committee to keep Our Water Pure petitioned EPA to designate the Brunswick Shale and Sandstone Aquifer of the Ridgewood Area as sole source aquifer. On January 15, 1980, EPA published a notice in the Federal Register announcing a public comment period and setting a public hearing date. A public hearing was conducted on February 28, 1980, and the public was allowed to submit comments on the petition until March 28, 1980.

II. Basis for Determination

Among the factors to be considered by the Administrator in connection with the designation of an under Section 1424(e) are: (1) Whether the aquifer is the area's sole or principal source of drinking water, and (2) whether contamination of the aquifer would create a significant hazard to public health.

On the basis of information available to this Agency, the Administrator has made the following findings, which are the basis for the determination noted above:

1. The Brunswick Shale and Sandstone Aquifer of the Ridgewood Area is the "sole source" of drinking water for the approximately 68,820 residents of Ridgewood, Midland Park, Glen Rock, and Wyckoff, New Jersey.

2. There is no existing alternative drinking water source or combination of sources which provides fifty percent or more of the drinking water to the designated area.

3. The Brunswick formation is a soft red shale interbedded with coarse grained sandstone. The aquifer is overlain by permeable unconsolidated glacial and recent deposits. As a result of permeable soil characteristics, the Brunswick Shale and Sandstone Aquifer of the Ridgewood Area is highly susceptible to contamination through its recharge zone from a number of sources, including but not limited to, chemical spills, leachate from landfills, stormwater runoff, highway deicers, faulty septic systems, wastewater treatment systems, and waste disposal lagoons. The aquifer is also susceptible to contamination to a lesser degree from the same sources, through its streamflow source zone. Since ground water contamination can be difficult or impossible to reverse and since the aquifer in this area is solely relied upon for drinking water purposes by the population of the Ridgewood Area, contamination of the aquifer could pose a significant hazard to public health.

III. Description of the Brunswick Shale and Sandstone Aquifer of the Ridgewood Area, Its Recharge Zone and Its Streamflow Source Zone

The Brunswick Shale and Sandstone Aquifer is a soft red shale interbedded with coarse grained sandstone. The formation, located in northern New Jersey, is fairly large, extending south into Pennsylvania and north into New York. Igneous intrusions which form the Watchung Mountains and the Palisades, also form the western and eastern boundaries of the Burnswick formation, respectively. The area in which Federal financially assisted projects will be subject to review is the portion of the Brunswick Shale and Sandstone Aquifer in the Ridgewood Area, its streamflow source zone, and its recharge zone.

For the purposes of this designation, the Brunswick Shale and Sandstone Aquifer of the Ridgewood Area is considered to include the entire municipalities of Ridgewood, Midland Park, Glen Rock, and Wyckoff, New Jersey. It's recharge zone is considered to be one and the same with this area. The streamflow source zone is that portion of the drainage basins of Ho Ho Kus Brook and Saddle River Run located upstream of the Ridgewood area. This includes all or a portion of the following New Jersey municipalities: Waldwick, Allendale, Ramsey, Mahwah, Franklin Lakes, Ho Ho Kus, Saddle River, Upper Saddle River, Woodcliff Lake, Hillside, Washington, Montvale, as well as Ramapo Township, New York.

IV. Information Utilized in Determination

The information utilize in this determination includes the petition, written and verbal comments submitted by the public, and various technical publications. The above data is available to the public and may be inspected during normal business hours at the U.S. Environmental Protection Agency, Region II, Water Supply Branch, 26 Federal Plaza, New York, New York 10278.

V. Project Review

EPA Region II is working with the Federal agencies that may in the future provide financial assistance to projects in the area of concern. Interagency procedures have been developed through which EPA will be notified of proposed commitments by Federal agencies for projects which could contaminate the Brunswick Shale and Sandstone Aquifer, upon which the Ridgewood Area is dependent for its sole source water supply. EPA will evaluate such projects and, where necessary, conduct an in-depth review, including soliciting public comments where appropriate. Should the Administrator determine that a project may contaminate the aquifer through its recharge zone so as to create a significant hazard to public health, no commitment for Federal financial assistance may be entered into. However, a commitment for Federal financial assistance may, if authorized under another provision of law, be entered into to plan or design the project to assure that it will not so contaminate the aquifer.

Although the project review process cannot be delegated, the U.S. Environmental Protection Agency will rely to the maximum extent possible on any existing or future State and local control mechanisms in protecting the ground water quality of the Brunswick Shale and Sandstone Aquifer on which the Ridgewood Area is dependent for its sole source water supply. Included in the review of any Federal financially assisted project will be coordination with the State and local agencies. Their comments will be given full consideration and the Federal review process will attempt to complement and support State and local ground water protection mechanisms.

VI. Summary and Discussion of Public Comments

Most comments were generally in favor of designation. Two local governments submitted resolutions in support of designation. Only two commenters expressed any reservations regarding the designation.

One commenter expressed concern that the proposed designation would provide protection which is duplicative of State and local controls and may lead to unnecessary bureaucratic delays of

REFERENCE NO. 6

NUS CORPORATION TELECON NOTE

CONTROL NO:	DATE:	TIME:
02-8904-65	5/10/89	1145

DISTRIBUTION:

SERVOMETER CORP

FILE

BETWEEN:	OF:	PHONE:
Bill Kowalski	TOWNSHIP OF CEDAR GROVE ENGINEERING OFFICE	(201) 239/410

AND: P. Solinski (NUS)

DISCUSSION:

RE: Water sources for CEDAR GROVE

He stated that 80% of Water comes from the North Jersey District Water supply, 10% from Passaic ~~County~~ Valley Water Commission and 10% NJ American Supply. All of these sources are external from Cedar Grove. Knows of no wells within the town used ~~from~~ as for drinking. Also stated that the Cedar Grove ~~Reservoir~~ ~~Reserve~~ Reservoir is owned by Newark.

ACTION ITEMS:

NUS 067 REVISED 0581

REFERENCE NO. 7

Uncontrolled Hazardous Waste Site Ranking System

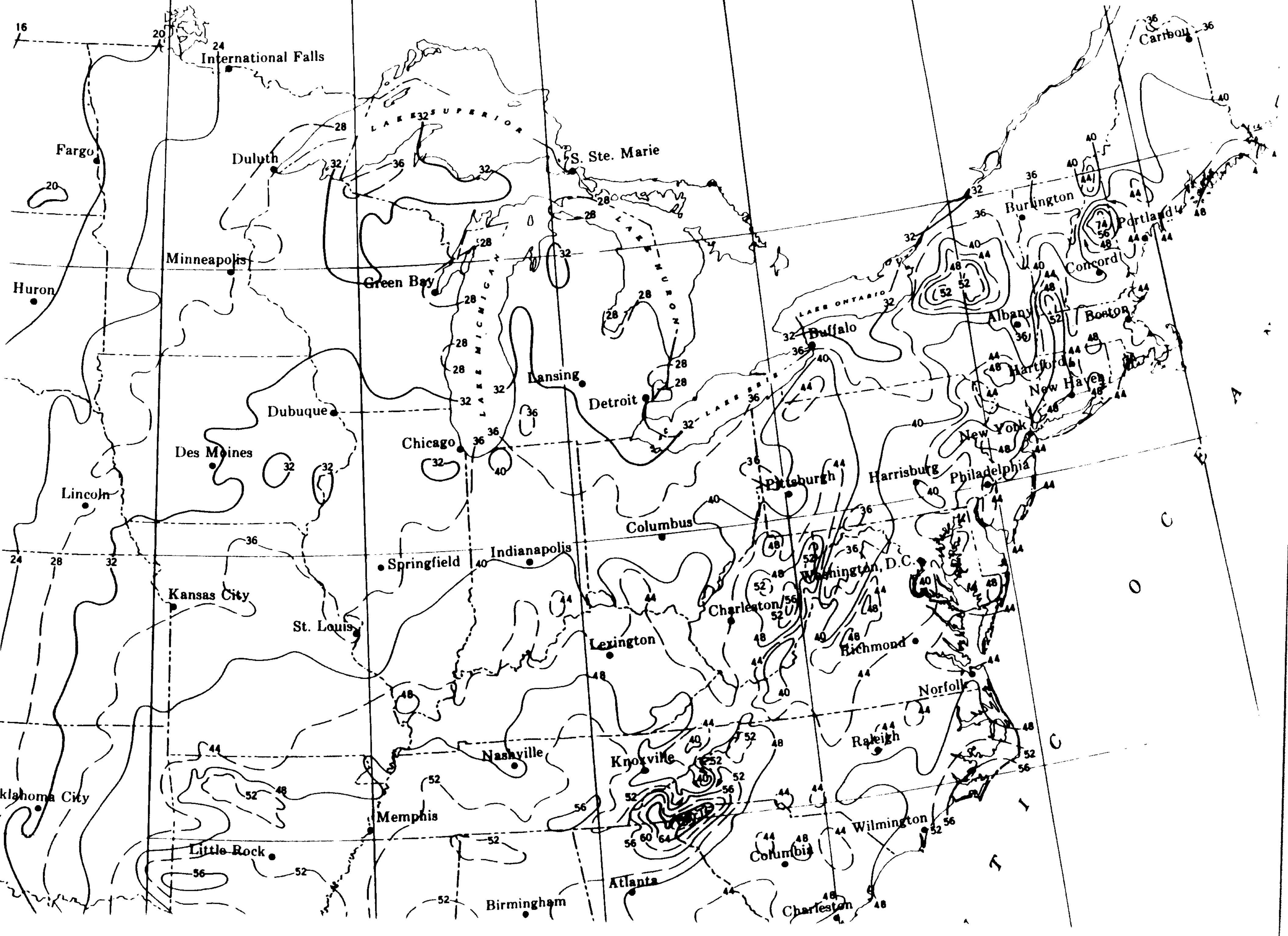
A Users Manual
(HW-10)

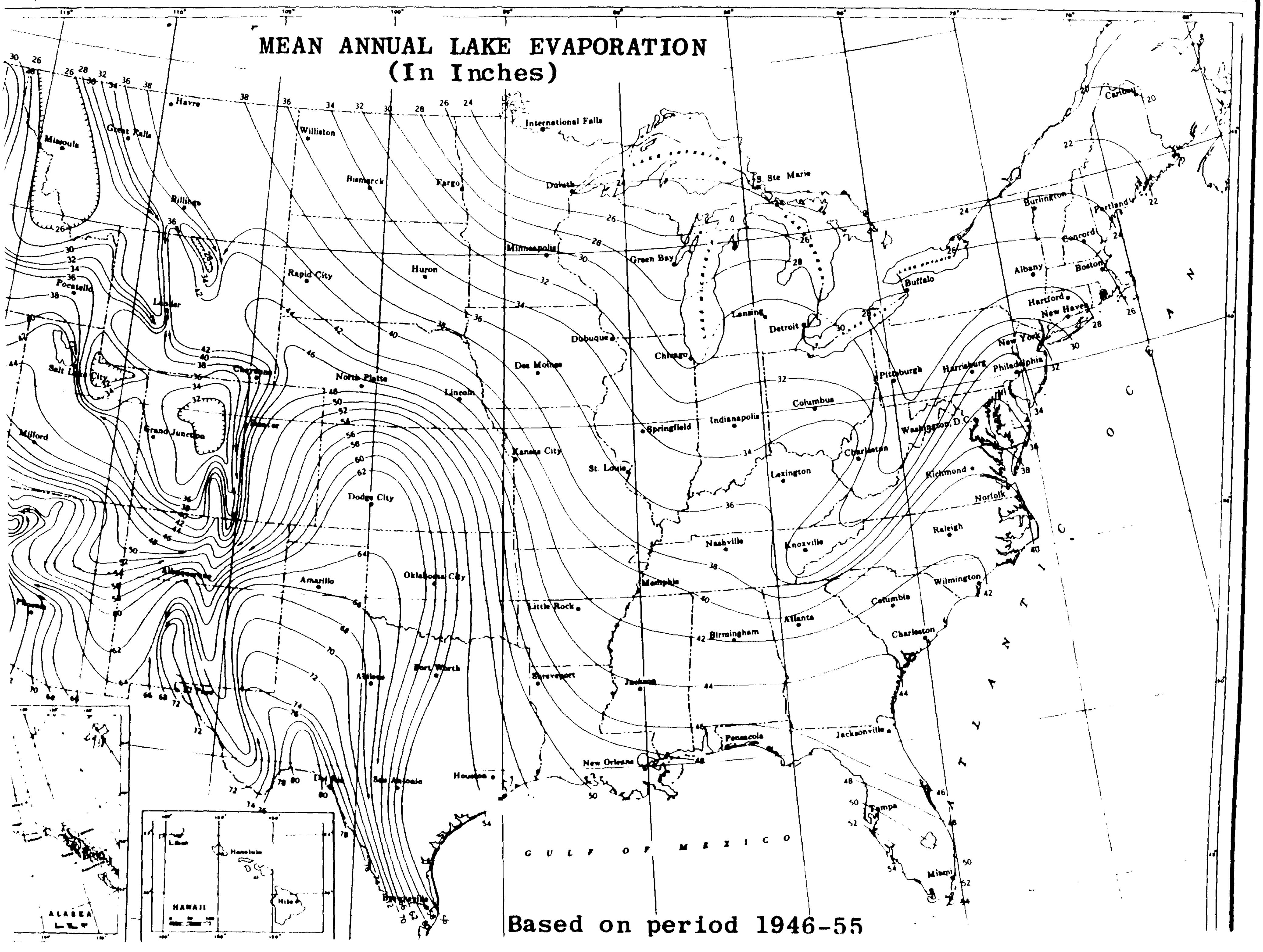
Originally Published in
the July 16, 1982, *Federal Register*

United States
Environmental Protection
Agency

1984

NORMAL ANNUAL TOTAL PRECIPITATION (Inches)




MEAN ANNUAL LAKE EVAPORATION
(In Inches)
Havre
Missoula
Great Falls
Williston
Bismarck
Fargo
International Falls
Duluth
S. Ste Marie
Billings
Minneapolis
Green Bay
Burlington
Portland
Concord
Albany
Boston
Buffalo
Rapid City
Huron
Pocatello
Lander
Lansing
Detroit
Dubuque
Chicago
Hartford
New Haven
New York
Salt Lake City
Cheyenne
North Platte
Lincoln
Des Moines
Pittsburgh
Harrisburg
Philadelphia
Columbus
Indianapolis
Springfield
Grand Junction
Milford
Kansas City
Washington, D.C.
Charleston
St. Louis
Lexington
Richmond
Norfolk
Dodge City
Nashville
Knoxville
Raleigh
Amarillo
Oklahoma City
Memphis
Wilmington
Little Rock
Columbia
Atlanta
Birmingham
Charleston
Fort Worth
Shreveport
Jackson
Jacksonville
Pensacola
New Orleans
Houston
San Antonio
Tampa
Miami
GULF OF MEXICO
ATLANTIC OCEAN
ALASKA
HAWAII
Honolulu
Hilo
Based on period 1946-55

1 YEAR 24-HOUR RAINFALL (inches)

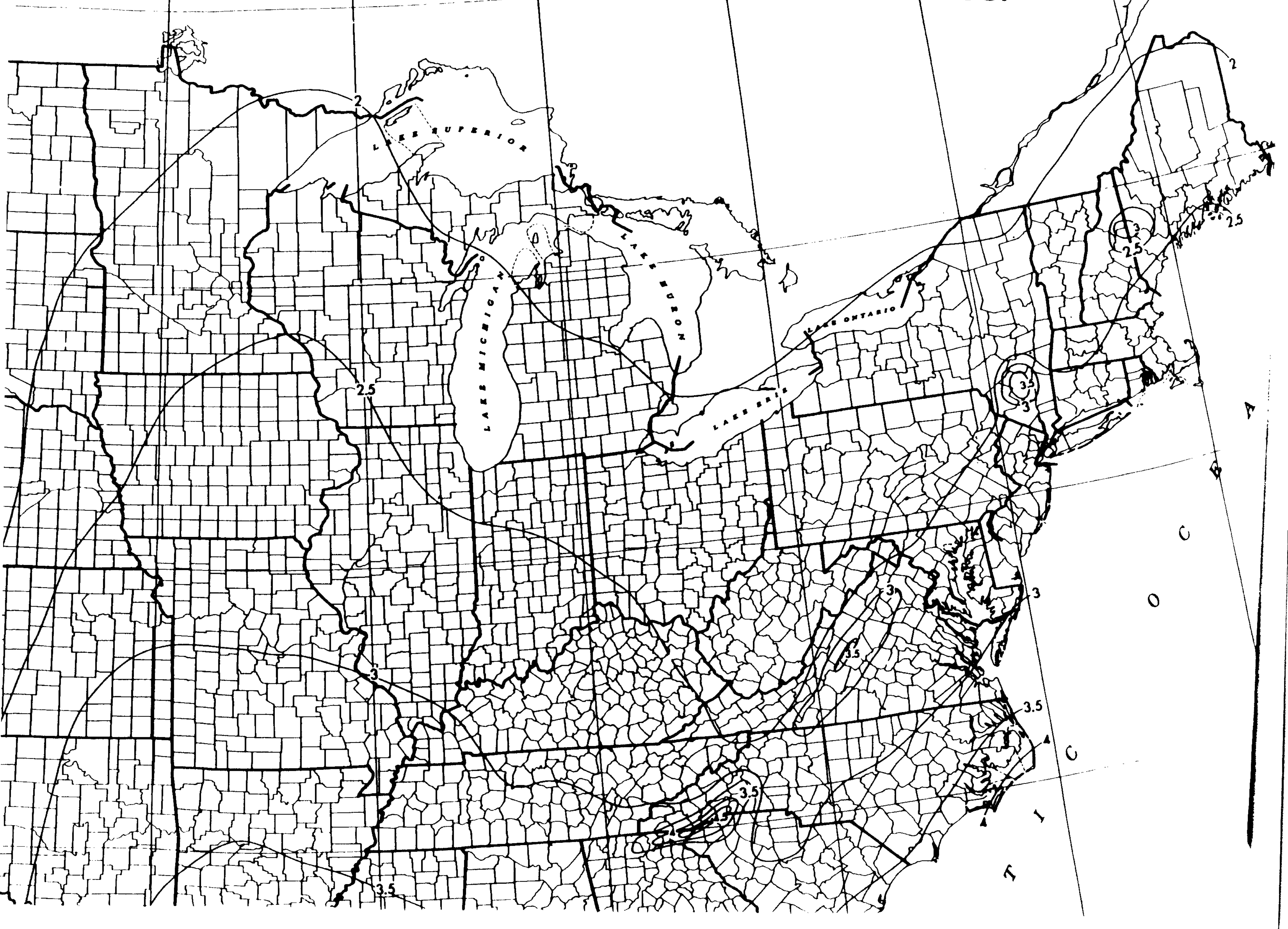


TABLE 2

PERMEABILITY OF GEOLOGIC MATERIALS*

Type of Material	Approximate Range of Hydraulic Conductivity	Assigned Value
Clay, compact till, shale; unfractured metamorphic and igneous rocks	$<10^{-7}$ cm/sec	0
Silt, loess, silty clays, silty loams, clay loams; less permeable limestone, dolomites, and sandstone; moderately permeable till	10^{-5} - 10^{-7} cm/sec	1
Fine sand and silty sand; sandy loams; loamy sands; moderately permeable limestone, dolomites, and sandstone (no karst); moderately fractured igneous and metamorphic rocks, some coarse till	10^{-3} - 10^{-5} cm/sec	2
Gravel, sand; highly fractured igneous and metamorphic rocks; permeable basalt and lavas; karst limestone and dolomite	$>10^{-3}$ cm/sec	3

*Derived from:

Davis, S. N., Porosity and Permeability of Natural Materials in Flow-Through Porous Media, R.J.M. DeWest ed., Academic Press, New York, 1969

Freeze, R.A. and J.A. Cherry, Groundwater, Prentice-Hall, Inc., New York, 1979

TABLE 12

INCOMPATIBLE MATERIALS

In the lists below, the mixing of a Group A material with a Group B material may have the potential consequence as noted.

Group 1-A	Group 1-B
Acetylene sludge	Acid sludge
Akaline caustic liquids	Acid and water
Alkaline cleaner	Battery acid
Alkaline corrosive liquids	Chemical cleaners
Alkaline corrosive battery fluid	Electrolyte acid
Caustic wastewater	Etching acid liquid or solvent
Lime sludge and other corrosive alkalies	Pickling liquor and other corrosive acids
Lime wastewater	Spent acid
Lime and water	Spent mixed acid
Spent caustic	Spent sulfuric acid

Potential consequences: Heat generation; violent reaction.

Group 2-A	Group 2-B
Aluminum	Any waste in Group 1-A or 1-B
Berylium	
Calcium	
Lithium	
Potassium	
Sodium	
Zinc powder	
Other reactive metals and metal hydrides	

Potential consequences: Fire or explosion; generation of flammable hydrogen gas.

Group 3-A	Group 3-B
Alcohols	Any concentrated waste in Groups 1-A or 1-B
Water	Calcium
	Lithium
	Metal hydrides
	Potassium
	SO_2Cl_2, $SOCl_2$, PCl_2, CH_3, $SiCl_3$
	Other water-reactive waste

Potential consequences: Fire, explosion, or heat generation; generation of flammable or toxic gases.

Group 4-A	Group 4-B
Alcohols	Concentrated Group 1-A or 1-B wastes
Aldehydes	Group 2-A wastes
Halogenated hydrocarbons	
Nitrated hydrocarbons	
Unsaturated hydrocarbons	
Other reactive organic compounds and solvents	

Potential consequences: Fire, explosion, or violent reaction.

Group 5-A	Group 5-B
Spent cyanide and sulfide solutions	Group 1-B wastes

Potential consequences: Generation of toxic hydrogen cyanide or hydrogen sulfide gas.

Group 6-A	Group 6-B
Chlorates	Acetic acid and other organic acids
Chlorine	Concentrated mineral acides
Chlorites	Group 2-A wastes
Chromic acid	Group 4-A wastes
Hyphochlorites	Other flammable and combustible wastes
Nitrates	
Nitric acid, fuming	
Perchlorates	
Permanganates	
Peroxides	
Other strong oxidizers	

Potential consequences: Fire, explosion, or violent reaction.

Source: Hazardous Waste Management Law, Regulations, and Guidelines for the Handling of Hazardous Waste. California Department of Health, Sacramento, California, February 1975.

REFERENCE NO. 8

SUBJECT TO REVISION

WATER WITHDRAWAL POINTS AND NJGS CASE INDEX SITES WITHIN 5.0 MILES OF:

LATITUDE 404858
LONGITUDE 741127

DRAFT

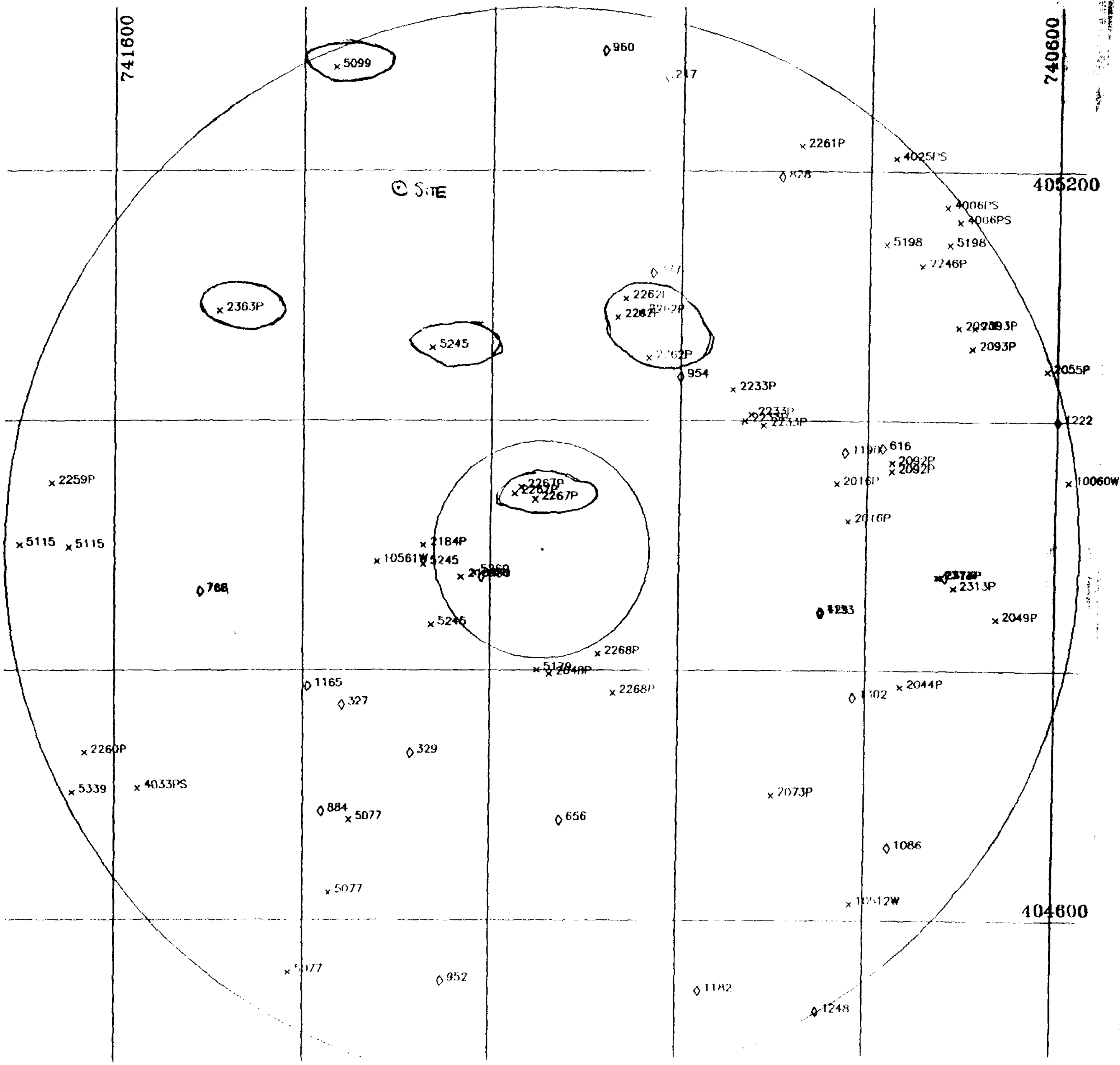
SCALE: 1:63,360
(1 inch = 1 Mile)

× WATER WITHDRAWAL POINTS
◊ NJGS CASE INDEX SITES
1 MILE AND 5 MILE RADII INDICATED

NJGS CASE INDEX DATA RETRIEVED FROM:
NEW JERSEY GEOLOGICAL SURVEY
ON 12/22/87

PLOT PRODUCED BY:
NJDEP
DIVISION OF WATER RESOURCES
BUREAU OF WATER ALLOCATION
CN-029
TRENTON, NJ 08625

DATE: 06/25/88



NUMBER	NAME	SOURCE ID	LOC ID	LAT	LON	
51[illegible]	ESSEX FELLS TOWNSHIP	46000[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
2259P	MONTCLAIR GOLF CLUB	4600163	[illegible]	[illegible]	[illegible]	[illegible]
2259P	MONTCLAIR GOLF CLUB	46001[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
2259P	MONTCLAIR GOLF CLUB	4600165	[illegible]	[illegible]	[illegible]	[illegible]
5115	ESSEX FELLS TOWNSHIP	46000[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
5339	RAHWAY, CITY OF	RAHWAY RIVER		[illegible]	[illegible]	
[illegible]	ESSEX COUNTY, DEPT. OF PARKS	2603[illegible]	1	[illegible]	[illegible]	[illegible]
[illegible]	ESSEX COUNTY COUNTRY CLUB	POND		[illegible]	[illegible]	[illegible]
2263P	ESSEX COUNTY HOSPITAL CENTER	2604[illegible]	10	[illegible]	[illegible]	
2263P	ESSEX COUNTY HOSPITAL CENTER	26048[illegible]	9	[illegible]	7414[illegible]	
2263P	ESSEX COUNTY HOSPITAL CENTER	46002613	8	[illegible]	7414[illegible]	
2263P	ESSEX COUNTY HOSPITAL CENTER	46002612	7	[illegible]	[illegible]	
5077	ORANGE CITY	26035440	7	[illegible]	[illegible]	[illegible]
5077	ORANGE CITY	2614444	7	[illegible]	741[illegible]	F
5079	PASSAIC VALLEY WATER COMM.	LITTLE FALLS		405250	741340	
5077	ORANGE CITY	26043222	8	4046[illegible]	741330	[illegible]
10561W	HAHNE'S	26001118	2	4048[illegible]	[illegible]	I
2184P	MOUNTAINSIDE HOSPITAL	2604[illegible]	2	404900	[illegible]	[illegible]
5245	MONTCLAIR TOWN	26036[illegible]	GLENFLD #2	404851	[illegible]	F
5245	MONTCLAIR TOWN	26036[illegible]	RAND W. #1	404822	741237	[illegible]
5245	MONTCLAIR TOWN	26045977	LORRAINE 3	405035	741237	F
2184P	MOUNTAINSIDE HOSPITAL	2602[illegible]	1	404845	741218	[illegible]
5260	GLEN RIDGE WATER DEPT.	26048[illegible]	2	[illegible]	741210	S
2267P	GLEN RIDGE COUNTRY CLUB	26041[illegible]	2	[illegible]	741145	S
2267P	GLEN RIDGE COUNTRY CLUB	46001[illegible]	3	[illegible]	741141	F
2267P	GLEN RIDGE COUNTRY CLUB	2601[illegible]	1	[illegible]	7411[illegible]	S
5179	BLOOMFIELD TOWN	26047[illegible]	1	[illegible]	[illegible]	T
2045P	NATIONAL STARCH & CHEMICAL	26045[illegible]	1	[illegible]	[illegible]	I
[illegible]	FOREST HILL FIELD CLUB	POND		[illegible]	741051	F
[illegible]	FOREST HILL FIELD CLUB	2604[illegible]	1	[illegible]	741041	S
[illegible]	UPPER MONTCLAIR COUNTRY CLUB	POND	[illegible]	[illegible]	741040	I
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[illegible]	UPPER MONTCLAIR COUNTRY CLUB	26011[illegible]	1	[illegible]	[illegible]	
[illegible]	UPPER MONTCLAIR COUNTRY CLUB	26048[illegible]	[illegible]	[illegible]	[illegible]	I
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2233P	HOFFMANN-LAROCHE INC.	46001[illegible]	[illegible]	[illegible]	7407[illegible]	F
2233P	HOFFMANN-LAROCHE INC.	46001[illegible]	[illegible]	[illegible]	[illegible]	I
2233P	HOFFMANN-LAROCHE INC.	46001[illegible]	[illegible]	[illegible]	[illegible]	I
2073P	INTERNATIONAL MINERALS & CHEM.	4600[illegible]	1	404700	[illegible]	I
2073P	INTERNATIONAL MINERALS & CHEM.	4600[illegible]	[illegible]	[illegible]	[illegible]	I
2073P	INTERNATIONAL MINERALS & CHEM.	2605[illegible]	[illegible]	[illegible]	[illegible]	I
[illegible]	FRITZCHE DODGE & OLCOTT	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
2016P	ITT AVIONICS DIVISION	26018[illegible]	1	[illegible]	[illegible]	I
2016P	ITT AVIONICS DIVISION	26018[illegible]	2	[illegible]	[illegible]	
2016P	ITT AVIONICS DIVISION	2601[illegible]	[illegible]	[illegible]	[illegible]	
2016P	ITT AVIONICS DIVISION	[illegible]	4 [illegible]	[illegible]	[illegible]	
[illegible]	V.H. SWENSON CO., INC.	[illegible]	1	[illegible]	[illegible]	[illegible]
5193	WALLINGTON BOROUGH	4600[illegible]	[illegible]	[illegible]	[illegible]	
5193	WALLINGTON BOROUGH	4600[illegible]	5	[illegible]	[illegible]	
[illegible]	GIVAUDAN CORPORATION	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
[illegible]	GIVAUDAN CORPORATION	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
[illegible]	[illegible], INC.	[illegible]		[illegible]	[illegible]	[illegible]
[illegible]	GRAND UNION CO.	[illegible]		[illegible]	[illegible]	[illegible]
[illegible]	[illegible] INC.	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]

DESCRIPTION OF WATER WITHDRAWAL POINTS

The Water Withdrawal Points listing contains the following fields:

CAPACITY: the pump capacity in gallons per minute
COUNTY: county the withdrawal point is in
DEPTH: depth of the well or pond
DISTANCE: distance in miles from center of circle
GEO1: the ground or surface water source
GEO2: a secondary source of the water
LAT: latitude of the withdrawal point
LLACC: accuracy of the latitude and longitude estimates
LOCID: the local identification of the withdrawal point, or a continuation of the SOURCEID field for surface water
LON: longitude of the withdrawal point
MUN: the municipality the withdrawal point is in
NAME: name of the permit, certificate, or registration holder
NUMBER: Water Allocation permit, Agricultural Certification, or Registration number
SOURCEID: the well permit number or other identifier for the water withdrawal

The listing that you have requested includes most wells and surface intakes that are in the Water Allocation Permits, and representative sources from most of the Agricultural Certificates. **Recognizing the fact that the list will contain errors and omissions, it is advisable to use this resource as a guide and to verify all data**. We try to maintain an accurate database; however, we can not yet guarantee reliability. If you spot any errors we would be very grateful to hear about them. Please call or write to us in reference to the "Radius Program" at:

NJDEP
Division of Water Resources
Bureau of Water Allocation
CN-029
Trenton, NJ 08625

(609) 292-2957

Thank you.

Please see the attached sheets for definitions of the codes used in the Water Withdrawal Points listing.

CODES USED IN THE WATER WITHDRAWAL POINTS LISTING

This packet contains information on the database codes that the Bureau of Water Allocation uses in the Water Withdrawal Points Listing.

COUNTY:

01 - Atlantic	15 - Gloucester	29 - Ocean
03 - Bergen	17 - Hudson	31 - Passaic
05 - Burlington	19 - Hunterdon	33 - Salem
07 - Camden	21 - Mercer	35 - Somerset
09 - Cape May	23 - Middlesex	37 - Sussex
11 - Cumberland	25 - Monmouth	39 - Union
13 - Essex	27 - Morris	41 - Warren

GEO:

RECENT	
Surficial Deposits	GRS
PLEISTOCENE	
Glacial Undifferentiated	GQGU
Stratified Drift	GQSD
Terminal Moraine	GQTM
Bridgeton	GQBS
Cape May	GQCM
Holly Beach Mbr.	GQCHB
Estuarine Sand	GQES
Pennsauken	GQPS
TERTIARY	
Beacon Hill	GTBH
Cohansey	GTCH
Cohansey & Kirkwood	GTCK
Kirkwood	GTKW
Upper	GTKWU
Rio Grande	GTKRG
Lower	GTKWL
Piney Point Mbr.	GTKPP
Shark River Marl	GTSR
Manasquan Marl	GTMQ
Vincentown Sand	GTVT
Hornerstown Marl	GTHT
CRETACEOUS	
Red Bank	GKRB
Navesink	GKNS
Mount Laurel	GKML
Wenonah	GKWE
Mount Laurel & Wenonah	GKMW
Marshalltown	GKMT
Englishtown	GKET
Woodbury	GKWB
Merchantville	GKMV
Magothy	GKM

Old Bridge	GKROB
Raritan	GKR
Sayreville Sand	GKRSS
Farrington	GKRF
Raritan/Magothy	GKMR
Potomac	GKP
TRIASSIC	
Brunswick Formation	GTRB
Lockatong Formation	GTRL
Stockton Formation	GTRS
Basalt	GTRBS
Diabase	GTRDB
Conglomerate	GTRCG
DEVONIAN	
Undifferentiated	GD
SILURIAN	
Bossardville Limestone	GSBD
Decker Formation	GSDK
Longwood Shale	GSLS
Poxono Island Fm	GSPI
Greenpond Conglomerate	GSGP
High Falls	GSHF
Shawangunk Fm	GSSG
ORDOVICIAN	
Martinsburg Fm	GOMB
Jacksonburg Fm	GOJB
Kittatinny Group	GOK
Outleaunee Fm	GOKO
Harmonyvale Mbr	GOKOH
Beaver Run Mbr	GOKOB
Epler	GOKE
Rickenbach	GOKR
CAMBRO ORDOVICIAN	
Kittatinny Fm	GCOK
CAMBRIAN	
Hardyston Quartzite	GCH
Allentown Fm	GCKA
Upper Mbr	GCKU
Limeport Mbr	GCKLP
Leithsville Fm	GCKL
Walkill Mbr	GCKLW
Hamburg Mbr	GCKLH
Califon Mbr	GCKLC
PRECAMBRIAN	
Granite	GPCGR
Gneiss	GPCGN
Undifferentiated	GPC

Franklin Lms	GPCFL
DELAWARE RIVER BASIN	
Unknown or Non-Specific	SD
Alloways Creek	SDALL
Alexsocken Creek	SDALE
Assiscunk Creek	SDASC
Assunpink Creek	SDASP
Big Timber Creek	SDBIG
Blacks Creek	SDBLA
Cooper's Creek	SDCOO
Crafts Creek	SDCRA
Crosswicks Creek	SDCRO
Delaware River	SDDEL
Flat Brook	SDFLA
Hakihokake Creek	SDHAK
Harihokake Creek	SDHAR
Jacob's Creek	SDJAC
Lockatong Creek	SDLOC
Lopatcong Creek	SDLOP
Mantua Creek	SDMNT
Musconetcong River	SDMUS
Nichisakawick Creek	SDNIC
Old Man's Creek	SDOLD
Paulins Kill	SDPAU
Pennsauken Creek	SDPEN
Pequest River	SDPST
Pohatcong Creek	SDPOH
Raccoon Creek	SDRAC
Rancocas Creek	SDRAN
Salem River	SDSAL
Wickecheoke Creek	SDWIC
RARITAN RIVER BASIN	
Unknown or Non-Specific	SR
Lawrence Brook	SRLAW
Lower Raritan	SRLOW
Millstone River	SRMIL
North Branch Raritan	SRNBR
South Branch Raritan	SRSBR
South River	SRSRV
PASSAIC RIVER BASIN	
Unknown or Non-Specific	SP
Canoe Brook	SPCAN
Lower Mid-Passaic River	SPLMP
Lower Passaic	SPLOW
Passaic River	SPPAS
Peckman River	SPPEC
Pequannock River	SPPNK
Pompton River	SPPOM
Ramapo River	SPRAM
Rockaway River	SPROC
Saddle River	SPSAD

Upper Mid-Passaic River	SPUMP
Upper Passaic River	SPUPP
Wanaque River	SPWAN
Whippany River	SPWHI
ATLANTIC COASTAL BASIN	
Unknown or Non-Specific	SC
Atlantic County Coastal	SCATL
Cape May County Coastal	SCCAP
Cedar Creek	SCCED
Great Egg Harbor River	SCGRE
Manasquan River	SCMSQ
Metedeconk River	SCMET
Monmouth County Coastal	SCMON
Mullica River	SCMUL
Navesink River	SCNAV
Ocean County Coastal	SCOCE
Raritan Bay	SCRAR
Shark River	SCSHA
Shrewsbury River	SCSHR
Toms River	SCTOM
Tuckahoe River	SCTUC
HUDSON RIVER BASIN	
Unknown or Non-Specific	SH
Hudson River	SHHUD
Papakating Creek	SHPAP
Pochuck Creek	SHPOC
Wallkill River	SHWAL
HACKENSACK RIVER BASIN	
Unknown or Non-Specific	SK
Hackensack River	SKHAC
RAHWAY RIVER BASIN	
Unknown or Non-Specific	SY
Rahway River	SYRAH
ELIZABETH RIVER BASIN	
Unknown or Non-Specific	SE
Elizabeth River	SEELI
DELAWARE BAY BASIN	
Unknown or Non-Specific	SB
Cohansey River	SBCOH
Maurice River	SBMAU
Stow Creek	SBSTO

LLACC:

S - accurate to +- 1 second
F - accurate to +- 5 seconds
T - accurate to +- 10 seconds
M - accurate to +- 1 minute
U - accuracy unknown

MUN: ATLANTIC COUNTY (01)

01 - Absecon City	02 - Atlantic City
03 - Brigantine City	04 - Buena Boro
05 - Buena Vista Twp	06 - Corbin City
07 - Egg Harbor City	08 - Egg Harbor Twp
09 - Estell Manor City	10 - Folsom Boro
11 - Galloway Twp	12 - Hamilton Twp
13 - Hammonton Town	14 - Linwood City
15 - Longport Boro	16 - Margate City
17 - Mullica Twp	18 - Northfield City
19 - Pleasantville City	20 - Port Republic City
21 - Somers Point City	22 - Ventnor City
23 - Weymouth Twp	

BERGEN COUNTY (03)

01 - Allendale Boro	02 - Alpine Boro
03 - Bergenfield Boro	04 - Bogota Boro
05 - Carlstadt Boro	06 - Cliffside Park Boro
07 - Closter Boro	08 - Cresskill Boro
09 - Demarest Boro	10 - Dumont Boro
12 - East Rutherford Boro	13 - Edgewater Boro
11 - Elmwood Park Boro	14 - Emerson Boro
15 - Englewood City	16 - Englewood Cliffs Boro
17 - Fair Lawn Boro	18 - Fairview Boro
19 - Fort Lee Boro	20 - Franklin Lakes Boro
21 - Garfield Boro	22 - Glen Rock Boro
23 - Hackensack City	24 - Harrington Park Boro
25 - Hasbrouck Heights Boro	26 - Haworth Boro
27 - Hillsdale Boro	28 - Hohokus Boro
29 - Leonia Boro	30 - Little Ferry Boro
31 - Lodi Boro	32 - Lyndhurst Twp
33 - Mahwah Twp	34 - Maywood Boro
35 - Midland Park Boro	36 - Montvale Boro
37 - Moonachie Boro	38 - New Milford Boro
39 - North Arlington Boro	40 - Northvale Boro
41 - Norwood Boro	42 - Oakland Boro
43 - Old Tappan Boro	44 - Oradell Boro
45 - Palisades Park Boro	46 - Paramus Boro
47 - Park Ridge Boro	48 - Ramsey Boro
49 - Ridgefield Boro	50 - Ridgefield Park Village
51 - Ridgewood Village	52 - River Edge Boro
53 - River Vale Twp	54 - Rochelle Park Twp
55 - Rockleigh Boro	56 - Rutherford Boro
57 - Saddle Brook Twp	58 - Saddle River Boro
59 - South Hackensack Twp	60 - Teaneck Twp
61 - Tenafly Boro	62 - Teterboro Boro
63 - Upper Saddle River Boro	64 - Waldwick Boro
65 - Wallington Boro	66 - Washington Twp
67 - Westwood Boro	68 - Wood-Ridge Boro
69 - Woodcliff Lake Boro	70 - Wyckoff Twp

BURLINGTON COUNTY (05)

01 - Bass River Twp	02 - Beverly City
03 - Bordentown City	04 - Bordentown Twp

05 - Burlington City
07 - Chesterfield Twp
09 - Delanco Twp
11 - Eastampton Twp
13 - Evesham Twp
15 - Florence Twp
17 - Lumberton Twp
19 - Maple Shade Twp
21 - Medford Twp
23 - Mount Holly Twp
25 - New Hanover Twp
27 - Palmyra Boro
29 - Pemberton Twp
31 - Riverton Boro
33 - Southampton Twp
35 - Tabernacle Twp
37 - Westampton Twp
39 - Woodland Twp

06 - Burlington Twp
08 - Cinnaminson Twp
10 - Delran Twp
12 - Edgewater Park Twp
14 - Fieldsboro Boro
16 - Hainesport Twp
18 - Mansfield Twp
20 - Medford Lakes Boro
22 - Moorestown Twp
24 - Mount Laurel Twp
26 - North Hanover Twp
28 - Pemberton Boro
30 - Riverside Twp
32 - Shamong Twp
34 - Springfield Twp
36 - Washington Twp
38 - Willingboro Twp
40 - Wrightstown

CAMDEN COUNTY (07)

01 - Audubon Boro
03 - Barrington Boro
05 - Berlin Boro
07 - Brooklawn Boro
09 - Cherry Hill Twp
11 - Clementon Boro
13 - Gibbsboro Boro
15 - Gloucester Twp
16 - Haddon Twp
19 - Hi-Nella Boro
21 - Lawnside Boro
23 - Magnolia Boro
25 - Mount Ephraim Boro
27 - Pennsauken Twp
29 - Pine Valley Boro
31 - Somerdale Boro
33 - Tavistock Boro
35 - Waterford Twp
37 - Woodlynne Boro

02 - Audubon Park Boro
04 - Bellmawr Boro
06 - Berlin Twp
08 - Camden City
10 - Chesilhurst Boro
12 - Collingswood Boro
14 - Gloucester City
18 - Haddon Heights Boro
17 - Haddonfield Boro
20 - Laurel Springs Boro
22 - Lindenwold Boro
24 - Merchantville Boro
26 - Oaklyn Boro
28 - Pine Hill Boro
30 - Runnemede Boro
32 - Stratford Boro
34 - Voorhees Twp
36 - Winslow Twp

CAPE MAY COUNTY (09)

01 - Avalon Boro
03 - Cape May Point Boro
05 - Lower Twp
07 - North Wildwood City
09 - Sea Isle City
11 - Upper Twp
13 - West Wildwood Boro
15 - Wildwood Crest Boro

02 - Cape May City
04 - Dennis Twp
06 - Middle Twp
08 - Ocean City
10 - Stone Harbor Boro
12 - West Cape May Boro
14 - Wildwood City
16 - Woodbine Boro

CUMBERLAND COUNTY (11)

01 - Bridgeton City
03 - Deerfield Twp
05 - Fairfield Twp

02 - Commercial Twp
04 - Downe Twp
06 - Greenwich Twp

07 - Hopewell Twp
08 - Lawrence Twp
09 - Maurice River Twp
10 - Millville City
11 - Shiloh Boro
12 - Stow Creek Twp
13 - Upper Deerfield Twp
14 - Vineland City

ESSEX COUNTY (13)

01 - Belleville Town
02 - Bloomfield Town
03 - Caldwell Boro
04 - Cedar Grove Twp
05 - East Orange City
06 - Essex Fells Boro
07 - Fairfield Boro
08 - Glen Ridge Boro
09 - Irvington Town
10 - Livingston Twp
11 - Maplewood Twp
12 - Millburn Twp
13 - Montclair Town
14 - Newark City
15 - North Caldwell Boro
16 - Nutley Town
17 - Orange City
18 - Roseland Boro
19 - South Orange Village
20 - Verona Boro
21 - West Caldwell Boro
22 - West Orange Town

GLOUCESTER COUNTY (15)

01 - Clayton Boro
02 - Deptford Twp
03 - East Greenwich Twp
04 - Elk Twp
05 - Franklin Twp
06 - Glassboro Boro
07 - Greenwich Twp
08 - Harrison Twp
09 - Logan Twp
10 - Mantua Twp
11 - Monroe Twp
12 - National Park Boro
13 - Newfield Boro
14 - Paulsboro Boro
15 - Pitman Boro
16 - South Harrison Twp
17 - Swedesboro Boro
18 - Washington Twp
19 - Wenonah Boro
20 - West Deptford Twp
21 - Westville Boro
22 - Woodbury City
23 - Woodbury Heights Boro
24 - Woolwich Twp

HUDSON COUNTY (17)

01 - Bayonne City
02 - East Newark Boro
03 - Guttenberg Town
04 - Harrison Town
05 - Hoboken City
06 - Jersey City
07 - Kearny Town
08 - North Bergen Twp
09 - Secaucus Twp
10 - Union City
11 - Weehawken Twp
12 - West New York Town

HUNTERDON COUNTY (19)

01 - Alexandria Twp
02 - Bethlehem Twp
03 - Bloomsbury Boro
04 - Califon Boro
05 - Clinton Town
06 - Clinton Twp
07 - Delaware Twp
08 - East Amwell Twp
09 - Flemington Boro
10 - Franklin Twp
11 - Frenchtown Boro
12 - Glen Gardner Boro
13 - Hampton Boro
14 - High Bridge Boro
15 - Holland Twp
16 - Kingwood Twp
17 - Lambertville City
18 - Lebanon Boro
19 - Lebanon Twp
20 - Milford Boro
21 - Raritan Twp
22 - Readington Twp
23 - Stockton Boro
24 - Tewksbury Twp
25 - Union Twp
26 - West Amwell Twp

MERCER COUNTY (21)

01 - East Windsor Twp	02 - Ewing Twp
03 - Hamilton Twp	04 - Hightstown Boro
05 - Hopewell Boro	06 - Hopewell Twp
07 - Lawrence Twp	08 - Pennington Boro
09 - Princeton Boro	10 - Princeton Twp
11 - Trenton City	12 - Washington Twp
13 - West Windsor Twp	

MIDDLESEX COUNTY (23)

01 - Carteret Boro	02 - Cranbury Twp
03 - Dunellen Boro	04 - East Brunswick Twp
05 - Edison Twp	06 - Helmetta Boro
07 - Highland Park Boro	08 - Jamesburg Boro
10 - Metuchen Boro	11 - Middlesex Boro
12 - Milltown Boro	13 - Monroe Twp
14 - New Brunswick City	15 - North Brunswick Twp
09 - Old Bridge Twp	16 - Perth Amboy City
17 - Piscataway Twp	18 - Plainsboro Twp
19 - Sayreville Boro	20 - South Amboy City
21 - South Brunswick Twp	22 - South Plainfield Boro
23 - South River Boro	24 - Spotswood Boro
25 - Woodbridge Twp	

MONMOUTH COUNTY (25)

30 - Aberdeen Twp	01 - Allenhurst Boro
02 - Allentown Boro	03 - Asbury Park City
04 - Atlantic Highlands Boro	05 - Avon-By-The-Sea Boro
06 - Belmar Boro	07 - Bradley Beach Boro
08 - Brielle Boro	09 - Colts Neck Twp
10 - Deal Boro	11 - Eatontown Boro
12 - Englishtown Boro	13 - Fair Haven Boro
14 - Farmingdale Boro	15 - Freehold Boro
16 - Freehold Twp	39 - Hazlet Twp
17 - Highland Boro	18 - Holmdel Boro
19 - Howell Twp	20 - Interlaken Boro
21 - Keansburg Boro	22 - Keyport Boro
23 - Little Silver Boro	24 - Loch Arbour Village
25 - Long Branch City	26 - Manalapan Twp
27 - Manasquan Boro	28 - Marlboro Twp
29 - Matawan Boro	31 - Middletown Twp
32 - Millstone Twp	33 - Monmouth Beach Boro
35 - Neptune City Boro	34 - Neptune Twp
37 - Ocean Twp	38 - Oceanport Boro
40 - Red Bank Boro	41 - Roosevelt Boro
42 - Rumson Boro	43 - Sea Bright Boro
44 - Sea Girt Boro	45 - Shrewsbury Boro
46 - Shrewsbury Twp	47 - South Belmar Boro
48 - Spring Lake Boro	49 - Spring Lake Heights Boro
36 - Tinton Falls Boro	50 - Union Beach Boro
51 - Upper Freehold Twp	52 - Wall Twp
53 - West Long Branch Twp	

MORRIS COUNTY (27)

01 - Boonton Town
02 - Boonton Twp
03 - Butler Boro
04 - Chatham Boro
05 - Chatham Twp
06 - Chester Boro
07 - Chester Twp
08 - Denville Twp
09 - Dover Town
10 - East Hanover Twp
11 - Florham Park Boro
12 - Hanover Twp
13 - Harding Twp
14 - Jefferson Twp
15 - Kinnelon Boro
16 - Lincoln Park Boro
17 - Madison Boro
18 - Mendham Boro
19 - Mendham Twp
20 - Mine Hill Twp
21 - Montville Twp
23 - Morris Plains Boro
22 - Morris Twp
24 - Morristown Town
26 - Mount Arlington Boro
27 - Mount Olive Twp
25 - Mountain Lakes Boro
28 - Netcong Boro
29 - Parsippany Troy-Hills Twp
30 - Passaic Twp
31 - Pequannock Twp
32 - Randolph Twp
33 - Riverdale Boro
34 - Rockaway Boro
35 - Rockaway Twp
36 - Roxbury Twp
37 - Victory Gardens Boro
38 - Washington Twp
39 - Wharton Boro

OCEAN COUNTY (29)

01 - Barnegat Light Boro
33 - Barnegat Twp
02 - Bay Head Boro
03 - Beach Haven Boro
04 - Beachwood Boro
05 - Berkeley Twp
06 - Brick Twp
07 - Dover Twp
08 - Eagleswood Twp
09 - Harvey Cedars Boro
10 - Island Heights Boro
11 - Jackson Twp
12 - Lacey Twp
13 - Lakehurst Boro
14 - Lakewood Twp
15 - Lavalette Boro
16 - Little Egg Harbor Twp
17 - Long Beach Twp
18 - Manchester Twp
19 - Mantaloking Boro
21 - Ocean Gate Boro
20 - Ocean Twp
22 - Pine Beach Boro
23 - Plumsted Twp
25 - Point Pleasant Beach Boro
24 - Point Pleasant Boro
26 - Seaside Heights Boro
27 - Seaside Park Boro
28 - Ship Bottom Boro
29 - South Toms River Boro
30 - Stafford Twp
31 - Surf City Boro
32 - Tuckerton Boro

PASSAIC COUNTY (31)

01 - Bloomingdale Boro
02 - Clifton City
03 - Haledon Boro
04 - Hawthorne Boro
05 - Little Falls Twp
06 - North Haledon Boro
07 - Passaic City
08 - Paterson City
09 - Pompton Lakes Boro
10 - Prospect Park Boro
11 - Ringwood Boro
12 - Totowa Boro
13 - Wanaque Boro
14 - Wayne Twp
15 - West Milford Twp
16 - West Paterson Boro

SALEM COUNTY (33)

01 - Alloway Twp
13 - Carney's Point Twp
02 - Elmer Boro
03 - Elsinboro Twp

04 - Lower Alloways Creek Twp
05 - Mannington Twp
06 - Oldmans Twp
07 - Penns Grove Boro
08 - Pennsville Twp
09 - Pilesgrove Twp
10 - Pittsgrove Twp
11 - Quinton Twp
12 - Salem City
14 - Upper Pittsgrove Twp
15 - Woodstown Boro

SOMERSET COUNTY (35)

01 - Bedminster Twp
02 - Bernards Twp
03 - Bernardsville Boro
04 - Bound Brook Boro
05 - Branchburg Twp
06 - Bridgewater Twp
07 - Far Hills Boro
08 - Franklin Twp
09 - Green Brook Twp
10 - Hillsborough Twp
11 - Manville Boro
12 - Millstone Boro
13 - Montgomery Twp
14 - North Plainfield Boro
15 - Peapack-Gladstone Boro
16 - Raritan Boro
17 - Rocky Hill Boro
18 - Somerville Boro
19 - South Bound Brook Boro
20 - Warren Twp
21 - Watchung Boro

SUSSEX COUNTY (37)

01 - Andover Boro
02 - Andover Twp
03 - Branchville Boro
04 - Byram Twp
05 - Frankford Twp
06 - Franklin Boro
07 - Fredon Twp
08 - Green Twp
09 - Hamburg Boro
10 - Hampton Twp
11 - Hardyston Twp
12 - Hopatcong Boro
13 - Lafayette Twp
14 - Montague Twp
15 - Newton Town
16 - Ogdensburg Boro
17 - Sandyston Twp
18 - Sparta Twp
19 - Stanhope Boro
20 - Stillwater Twp
21 - Sussex Boro
22 - Vernon Twp
23 - Walpack Twp
24 - Wantage Twp

UNION COUNTY (39)

01 - Berkeley Heights Twp
02 - Clark Twp
03 - Cranford Twp
04 - Elizabeth City
05 - Fanwood Boro
06 - Garwood Boro
07 - Hillside Twp
08 - Kenilworth Boro
09 - Linden City
10 - Mountainside Boro
11 - New Providence Boro
12 - Plainfield City
13 - Rahway City
14 - Roselle Boro
15 - Roselle Park Boro
16 - Scotch Plains Twp
17 - Springfield Twp
18 - Summit City
19 - Union Twp
20 - Westfield Town
21 - Winfield Twp

WARREN COUNTY (41)

01 - Allamuchy Twp
02 - Alpha Boro
03 - Belvidere Town
04 - Blairstown Twp
05 - Franklin Twp
06 - Frelinghuysen Twp
07 - Greenwich Twp
08 - Hackettstown Town
09 - Hardwick Twp
10 - Harmony Twp
11 - Hope Twp
12 - Independence Twp

13 - Knowlton Twp
14 - Liberty Twp
15 - Lopatcong Twp
16 - Mansfield Twp
17 - Oxford Twp
18 - Pahaquarry Twp
19 - Phillipsburg Town
20 - Pohatcong Twp
21 - Washington Boro
22 - Washington Twp
23 - White Twp

DESCRIPTION OF NJGS CASE INDEX SITES

The NJGS Case Index Sites listing contains the following fields:

CONTAM: contaminate code
DISTANCE: distance in miles from center of circle
FMCODE1: NJGS primary formation code
FMCODE2: NJGS secondary formation code
LAT: latitude of site
LON: longitude of site
NAME: name and location of site
SITENUM: site identifier
STATUS1: current status of site
STATUS2: further description of site status

The data in this listing is down-loaded on a regular basis from the New Jersey Geological Survey's Case Index File. The actual transfer date is printed on the left side of the enclosed map. This file contains many of the identified potential pollution sites in the State, but does not include all of them. For example the file does not generally include spill sites. Recognizing the fact that this list may contain significant errors and omissions, it is advisable to use this resource as a guide and to verify all information.

If you have any questions, please call or write to us in reference to the "Radius Program" at:

NJDEP
Division of Water Resources
Bureau of Water Allocation
CN-029
Trenton, NJ 08625

(609) 292-2957

Please see the attached sheets for definitions of the codes used in the NJGS Case Index Sites listing.

CODES USED IN THE NJGS CASE INDEX SITES LISTING

This packet contains definitions of the database codes used in the NJGS Case Index Sites listing.

CONTAM

00 = ORGANIC CHEM (VOLATILE)
01 = ORGANIC CHEM (NONVOLATILE)
02 = CHLOROFORM
03 = '1,2 - DICHLOROETHANE'
04 = '1,1,1 - TRICHLOROETHANE'
05 = TETRACHLOROETHYLENE
06 = DICHLOROETHYLENE
07 = TRICHLOROETHYLENE
08 = CARBON TETRACHLORIDE
09 = METHYLENE CHLORIDE
10 = ACETONE
11 = BENZENE
12 = TOLUNE
13 = XYLENE
14 = METHYL ISOBUTYL KETONE
15 = ETHYLENE DICHLORIDE
16 = METHYL ETHYL KETONE
17 = TETRAHYDROFURAN
18 = '1,2 - DICHLOROETHENE'
19 = '1,1 - DICHLOROETHENE'
20 = '1,1 - DICHLOROETHANE'
21 = '1,1,2,2 - TETRACHLOROETHYLENE'
22 = '1,1,2,2 - TETRACHLOROETHANE'
23 = TRICHLOROFLUOROMETHANE
24 = CHLOROBENZENE
25 = ETHYLBENZENE
26 = '1,2 - DICHLOROBENZENE'
27 = DICHLOROFLUOROMETHANE
28 = STYRENE
29 = ISOPROPYL ALCOHOL
30 = VINYL CHLORIDE
31 = HEXANE
32 = HEPTANE
33 = PHENTANE
34 = PHENOLS
35 = METALS
36 = LEAD
37 = IRON
38 = MERCURY
39 = CHROMIUM
41 = ARSENIC
42 = CADMIUM
43 = CHLORIDE
44 = SODIUM
45 = NITRATE

46 = SULFATE
47 = PESTICIDES
48 = HERBICIDES
49 = NATURAL RADIOACTIVITY
50 = 'PCB''S'
51 = GASOLINE
52 = DIESEL FUEL
53 = FUEL OIL
54 = INORGANIC CHEMICALS
55 = GREASES AND FATS
56 = SLUDGE
57 = ACID
58 = LEACHATE
59 = METHANE GAS
60 = DYE
61 = IODINE
62 = EXPLOSIVES
63 = PETROLEUM HYDROCARBONS
64 = PHARMACEUTICALS
65 = SURFACTANTS
66 = SEPTIC DISCHARGES
67 = RADIOACTIVE WASTE
68 = UNKNOWN
69 = TRICHLORETHYLENE
70 = COAL TAR
71 = ASBESTOS
72 = DIOXIN

FMCODE

0000 = 'N/A'
0100 = QUATERNARY
0101 = MEADOW MAT
0102 = ALLUVIUM
0103 = FILL
0104 = BEACH SANS
0110 = GLACIAL,UNDIFFERENTIATED
0120 = GLACIAL,UNSTRATIFIED TILL
0130 = STRATIFIED DRIFT
0140 = MORAINE
0144 = TERMINAL MORAINE
0148 = RECESSIONAL MORAINE
0150 = BRIDGETON
0160 = CAPE MAY
0161 = HOLLY BEACH MBR
0170 = PENNSAUKEN
1000 = TERTIARY
1010 = BEACON HILL
1020 = COHANSEY SAND
1025 = COHANSEY KIRKWOOD
1030 = KIRKWOOD SAND
1031 = UPPER MEMBER
1032 = LOWER MEMBER

1033 = PINEY POINT MBR
1040 = SHARK RIVER MARL
1050 = MANASQUAN MARL
1060 = VINCENTOWN SAND
1070 = HORNERSTOWN MARL
2000 = CRETACEOUS
2010 = RED BANK AND TINTON SANDS
2020 = NAVESANK MARL
2030 = MOUNT LAUREL WENONAH SANDS
2034 = MOUNT LAUREL SAND
2038 = WENONAH SAND
2040 = MARSHALLTOWN FM
2050 = ENGLISHTOWN SAND
2060 = WOODBURY CLAY
2070 = MERCHANTVILLE CLAY
2080 = MAGOTHY RARITAN FM
2081 = MAGOTHY RARITAN UPPER MBR
2084 = MAGOTHY RARITAN MIDDLE MBR
2088 = MAGOTHY RARITAN LOWER MBR
2090 = MAGOTHY FM
2091 = AMBOY STONEWARE CLAY MBR
2092 = OLD BRIDGE SAND MBR
2093 = SOUTH AMBOY FIRE CLAY MBR
2094 = SAYREVILLE SAND MBR
2095 = WOODBRIDGE CLAY MBR
2096 = FARRINGTON SAND MBR
2097 = RARITAN FIRE CLAY MBR
3000 = TRIASIC JURASSIC
3010 = BOONTON FM
3020 = BASALT UNDIFFERENTIATED
3021 = HOOK MT BASALT
3030 = TOWACO FM
3022 = PREAKNESS BASALT
3040 = FELTVILLE FM
3023 = ORANGE MT BASALT
3050 = DIABASE
3060 = CONGLOMERATE (HAMMER CREEK)
3070 = BRUNSWICK FM
3080 = LOCKATONG FM
3090 = STOCKTON FM
4000 = DEVONIAN
4010 = SKUNNEMUNK CNGLM
4020 = BELLVALE SS PEQUANAC SH
4030 = KANOUSE SANDSTONE
4040 = MARCELLUS SHALE
4050 = ONONDAGE LS
4060 = ESOPUS GRIT
4070 = ORISKANY BECRAFT LS
4080 = NEW SCOTLAND COEYMANS
5000 = SILURIAN
5010 = BOSSARDVILLE LS
5020 = DECKER FM
5030 = LONGWOOD SHALE
5040 = POXONO ISLAND

5050 = GREENPOND CONGLOMERATE
5060 = HIGH FALLS
5070 = SHAWANGUNK CONGLOMERATE
6000 = ORDOVICIAN
6010 = MARTINSBURG SHALE
6011 = PEN ARGYL MBR
6012 = RAMSEYBURG MBR
6013 = BUSHKILL MBR
6020 = JACKONSBURG LS
6030 = ONTLEAUNEE FM
6031 = HARMONYVALE MBR
6032 = BEAVER RUN MBR
6040 = EPLER FM
6041 = LAFAYETTE MBR
6042 = BIG SPRINGS MBR
6043 = BRANCHVILLE MBR
6050 = RICKENBACK DOLOMITE
6060 = MANHATTAN SCHIST
7000 = CAMBRO ORDOVICIAN
7010 = KITTATINNY SUPERGROUP
8000 = CAMBRIAN
8010 = ALLENTOWN FM
8011 = UPPER MBR
8012 = LIMEPORT MBR
8020 = LEITHSVILLE FM
8021 = WALLKILL MBR
8022 = HAMBURG MBR
8023 = CALIFON MBR
8030 = HARDYSTONE SAND
9000 = PRE CAMBRIAN
9010 = GRANITE
9011 = HORNBLEND GRANITE
9020 = GNEISS
9021 = GRANITE GNEISS
9022 = HORNBLEND GNEISS
9023 = QUARTZ OLIGOCLAISE GNEISS
9030 = ALASKITE
9040 = SYENITE
9041 = SYENITE GNESS
9050 = PYROXENE GRANITE
9060 = MICROCLINE GNEISS
9070 = FRANKLIN LIMESTONE
9080 = AMPHIBOLITE
9090 = BIOTITE GNEISS
9091 = MIXED GNEISS;

STATUS1

1 = INVESTIGATION 2 = AQUIFER RESTOR CONT
3 = REQUEST FOR GEOLOG
4 = MONITORING
5 = LITIGATION
6 = CLOSED

7 = OTHER
8 = BACKLOGGED
9 = TRANS PERMITS
0 = UNKNOWN
F = FIELD REC PROVIDED

STATUS2

O = INVEST CONT
A = CLEAN UP PLAN
B = SAMPLING PLAN
C = INITIAL INVEST
D = RQST PRPSL (RFP)
E = REMEDIAL INVEST
F = FSBLTY STUDY (FS)
G = PLAN, CONST REMEDIAL
H = FREE PRODUCT RECOVERY
I = DSLVD FRACTION RECOV
J = FREE, DSSLVD RECOV
K = CASE ABSORBED

REFERENCE NO. 9

0029-N
02-F803-55

NUS CORPORATION
SUPERFUND DIVISION

PROJECT NOTES

TO: FILE : POOR RICHARDS
DATE: 7/6/88
FROM: STAN SHULFER
COPIES: ———
SUBJECT: Town of Montclair Water Wells
REFERENCE: POOR RICHARDS 02-8803-55
NJ64$I

1:00 - 1:45 Met w/ MESSRS. Ferraro, and Englishman. I recieved copy of water test data for 1988.

Both gentlemen confirmed that all three of the community wells are contaminated w/ low levels of volatile organics, apparently from dry cleaning establishments.

Ground water flow is generally in a southern direction.

Population served by the Montclair water system:

Montclair - approximately 38,000
Clifton - approximately 130 homes
x 3.8 persons/home = 494
Little Falls - approximately 120 homes
x 3.8 persons/home = 456
Glen Ridge - unknown
would have to
check w/ Glen-Ridge
Borough

These wells are currently only used for peak demands during summertime when the allocation from Wanaque Reservoir is exceeded. over →

The water from wells is pumped into the distribution system. Water Quality is monitored at the well head as well as the entire system. Water is transmitted to Glen Ridge via the lower portion of the distribution system. Glen Ridge recieves water only from the Glenfield well.

Mr. Ferraro stated he will send a copy of the water distribution system map when paper becomes available for the blueprint machine.

Messrs Ferraro and Englishman stated that the borough in the past had sampled Toney's Brook. There seemed to be some correlation with chloride content in the stream and the Montclair Wells. Copy of the stream analyses results were provided. See map for approximate locations

Mr. Ferraro provided me with a copy of correspondence from N.J. DEP, about the closure of the YMCA well for high level of Tetrachloroethylene. See map for approximate location.

REFERENCE NO. 10

00256 02-8803-55

NUS CORPORATION TELECON NOTE

CONTROL NO:	DATE: 6/30/88	TIME: 855

DISTRIBUTION:
POOR RICHARDS
TDD 02-8803-55
BRICS NJ64 BI

BETWEEN: KEVIN RYAN	OF: Montclair Water Bureau	PHONE: (201) 744-4600

AND: STAN SHULFER (NUS)

DISCUSSION:
I spoke with Mr. Ryan concerning the locations of the three wells, their use, and reported contamination in one these wells.

Mr. Ryan stated that none of the wells have been shut down for contamination. All wells are used intermittently, during peak water demand. Glenfield and Rand #2 Wells were only recently turned on, about 2 weeks ago. The bulk of water comes from the Wanaque Water System operated by the North Jersey Water Supply Commission.

Well locations are as follows.

Glenfield Well – located off Maple Ave. behind Glenfield High School.

ACTION ITEMS:
Rand #2 – located at Chestnut St. and North Fullerton Ave.

Lorraine – located at Lorraine Ave. and North Mountain Ave.

Well are tested ~~on~~ a regular basis. Contact either Jack Ferrarro, Superintendent or Herb Englishman, Asst. Superintendent

REFERENCE NO. 11

NUS CORPORATION AND SUBSIDIARIES — **TELECON NOTE**

CONTROL NO:	DATE: 7/13/87	TIME: 1130

DISTRIBUTION: Poor Richards   TDD #02-8803-55   BRICS # NJ648I

BETWEEN: Henry Bogdanski	OF: Essex County Hospital Center	PHONE: (201) 228-8283

AND: STAN SHULFER

DISCUSSION: Mr. Bogdanski stated that wells # 7, 8, 9 and 10 are used for drinking water. The total demand on water is approximately 2,000 persons. Wells # 1-6 are located in a different aquifer, these will probably be abandoned because of the low yield. Wells are tested monthly for bacteria, A-280 parameters every 6 months, and inorganics once every 3 years.

ACTION ITEMS:

NUS 067 REVISED 0685

REFERENCE NO. 12

STAFF REPORT

In the matter of Town of Montclair	Application No. 5245 to renew permit to divert water from three wells in the Town of Montclair, Essex County.

In compliance with the provisions of N.J.S.A. 58:1A-1 et seq., the Town of Montclair, Municipal Building, Montclair, New Jersey is presumed to have filed an application with the Division of Water Resources for renewal of a permit to divert a maximum of 62 million gallons of water during any month at a maximum rate of 1,388 gallons per minute from existing Well Nos. 1, 2 and 3, each 300 feet deep screened in the Brunswick formation. The wells are located in the Town of Montclair. Diversion is for the purpose of supplying water to the Town of Montclair, Borough of Glen Ridge and Township of Cedar Grove in Essex County, and also parts of the Township of Little Falls and the City of Clifton in Passaic County.

The applicant requests no increase in their existing diversion rights and no public notice is required.

Background

1. This permit is a renewal of an allocation granted by the following:

Permit No.	Date	Source of Water	Diversion Amount (mgm)
1331	10/20/66	Well No. 1	18.60
1370	3/23/67	Well No. 2	31.00
1593	4/24/72	Well Nos. 1 & 2	45.00
1795	8/20/79	Well Nos. 1, 2 & 3	62.00

2. The diversion includes the following:

Well No.	Well Permit No.	Date Const.	Depth (ft.)	Pump Cap. (gpm)	Yield (gpm)
1-Rand Well	26-3688	1/67	300	400	470
2-Glenfield Well	26-3687	12/68	300	600	950
3-Lorraine Well	26-4597	10/12/76	300	400	400

3. The diversion serves the following communities:

   a. Town of Montclair
   b. Borough of Glen Ridge
   c. Township of Cedar Grove
   d. Parts of the Township of Little Falls and City of Clifton in Passaic County

4. The present water supply is being derived from both surface and groundwater. The applicant is a partner in the Wanaque/Ramapo system in the amount of 5 percent; resulting in an allocation of 5.2 mgd, base on 104 mgd safe yield, or 4.7 mgd, based on a safe yield of 94 mgd. The applicant's primary source of water supply is the Ramapo-Wanaque Reservoir System, operated by the North Jersey District Water Supply Commission.

Findings of Fact

1. A review of quarterly diversion reports for both surface and groundwater indicates the following water use:

Maximum Monthly Use (mgm)	Average Monthly Use (mgm)	Allocation (mgm)
208.86	158.39	62

2. The population served is approximately 55,014 which represents an average consumption of 92.8 gpcd, and peak consumption of 122.5 gpcd.

3. The following static water level data is available:

Well No.	Static Water Levels (below well head) When Constructed		Recent	
	(date)	(level)	(date)	(level)
1	1/67	19'	7/83	35'
2	12/68	20'	7/83	38'
3	10/76	11'	7/83	25'

4. The following long-term pumping test data is available:

Well No.	Date of Test	Yield (gpm)	Drawdown (feet)	Static Level (ft.)	Pumping Time (hrs.)
1	4/11/66	470	125	19	84
2	10/66	950	70	20	57.5
3	10/12/76	420	62	11	72

5. Public water supply wells within a 5-mile radius include the following:

Well Owner	No. of Wells	Depth (ft.)	Distance (miles)
City of Orange	7	51-124,500	2.0
Essex Fells Borough	16	40-550	3.3
South Orange Village	-	---	4.2
Passaic Valley Water Comm.	-	---	4.2

6. Water, after use, is discharged to Passaic Valley Sewerage

Commission regional treatment plant for treatment and discharged to the Passic River. The treatment works are not under a sewer connection ban or other restriction imposed by NJDEP.

7. The water system has storage capacity of 2.5 MG steel tank, and 1.5 MG underground reservoir.

8. The applicant has the following interconnections with adjacent systems:

Name of System	Size of Interconnection
Bloomfield	16"
City of Newark	20"
Commonwealth Water Company	16"

9. Applicant has agreement for sale of water to the following systems:

a. Township of Little Falls
b. Cedar Grove Township
c. Glen Ridge Borough
d. City of Clifton

10. The Montclair Sanitary Lanfill is about 1 mile away from the applicant's wellfield. The landfill is lined.

Staff Analysis

1. The water use is within the range of national average and is in the public interest.

2. The applicant's primary source of water supply is the Ramapo-Wanaque Reservoir System, operated by the North Jersey District Water Supply Commission. The applicant is a partner in the system in the amount of 5 percent, thus, resulting in an allocation of 5.2 mgd, based on 104 mgd safe yield, or 4.7 mgd, based on a safe yield of 94 mgd. The applicant is not required to obtain water allocation permit for surface water diversion from the system. However, the applicant is required to report the amount of surface water diverted from the system quarterly to the Water Allocation Office.

3. Based on existing information (Hearing testimony, 1979, Engineering report - Lorraine well) the diversion probably will not have an adverse affect on nearby wells. There was no significant change in static water level recorded despite many years of continuous operations. Therefore, natural replenishment of groundwater is probably occuring.

4. Diversion will not likely cause groundwater pollution. Within a one-mile radius there is one known sanitary landfill. However, the

landfill is lined to prevent leakage.

5. There is little probability of salt water intrusion because the diversion is far from the brackish waters and above sea level.

Conclusions

1. The allocation is necessary and in the public interest.

2. The diversion will not contribute to groundwater pollution or salt water intrusion.

3. The diversion will not exceed natural replenishment, and will not unduly interfere with other users.

Recommendations

Issuance of the permit is recommended subject to the standard conditions and to the following specific conditions:

1. The amount of water that may be diverted under this renewal permit shall be as follows:

Well Permit No.	Well Name or Designation	Pump Capacity (gpm)	Formation
26-3687	Rand Well #1	400	Brunswick
26-3688	Glenfield Well #2	600	Brunswick
26-4597	Lorraine Well #3	400	Basalt Flows

2. The total allocation from the above sources shall not exceed 62 million gallons per month at a maximum rate of 1,388 gpm.

3. All wells shall be metered. The total diversion for each month from each well shall be reported quarterly to the Water Allocation Office under Permit No. 5245. Applicant shall submit within 60 days of receipt of this permit a plan for monitoring diversions using the form available from the Water Allocation Office. Wells shall be equipped with a tag showing the well permit numbers listed above.

4. Diversion from the Ramapo-Wanaque Reservoir System shall be metered and the quantity diverted each month, shall be reported quarterly to the Water Allocation Office under Report No. 5245.

5. The applicant shall submit, with the fourth quarterly diversion report: (a) the total annual commercial/industrial water use; (b) the percent of unaccounted for water not metered; (c) the daily peak water consumption in gallons per capita per day.

6. Wells shall be constructed so that water level measurements can be made by tape at any time. Applicant shall submit with quarterly

diversion reports the static water level of wells identified in the monitoring plan (See 3. above). Measurement shall be made when the well pump has been shut down for a recovery period of 12 to 24 hours.

7. The pumping equipment capacity shall not be increased without prior approval by the Division.

8. All new services shall be metered upon installation.

9. All existing services shall be metered. A plan for installing meters in existing services satisfactory to the Water Allocation Office shall be submitted within six months of this approval.

10. The applicant shall adopt and implement to the satisfaction of the division, a continuous program to encourage water conservation in all types of use within the area served by the applicant. A report shall be submitted to the Division on or before June 30, 1984, and each year thereafter, on the actions taken pursuant to this program and the impact thereof.

11. Permittee shall have the right to apply at any time for modification of this permit by submission of the appropriate application forms. Permittee may informally discuss the terms and conditions of this permit at any time with the Water Allocation Office. An application for renewal shall be filed 3 months prior to the expiration date.

12. If the permittee fails to comply with any of the terms and conditions herein, or in the public interest and after due process, this approval may be reviewed for possible modification or revocation thereof.

13. The Division, at its option, may cause the permit to be reviewed at intervals of not less than 5 years to examine the need for the allocation and to determine compliance with the terms and conditions of the permit and whether a modification to the permit is necessary.

14. The permittee is subject to initial, renewal and annual fees as may be prescribed by the regulations.

15. This permit shall expire on January 31, 1999.

16. This permit shall not become operative unless and until the applicant has filed with the Division within 60 days from the date of transmittal hereof, written acceptance of the terms and conditions hereby imposed.

Respectfully submitted,

Vlado Michna
Water Allocation Office

1-24-84
ERH
OK WW

FORM 87

26-3688

DEPARTMENT OF CONSERVATION
AND ECONOMIC DEVELOPMENT
DIVISION OF WATER POLICY & SUPPLY

Permit No. ~~26-3688~~
Application No. ~~1384~~ 1370
County Essex

WELL RECORD

1. OWNER Town of Montclair ADDRESS Watchung Ave

Owner's Well No. ~~Three~~ 3 SURFACE ELEVATION ______ Feet (Above mean sea level)

2. LOCATION Glenfield Park South Bloomfield Ave Montclair N.J.

3. DATE COMPLETED Oct 20 1966 DRILLER Rinbrand Well Drilling Co Inc

4. DIAMETER: top 16x10 Inches Bottom 10 Inches TOTAL DEPTH 300 Feet

5. CASING: Type steel Diameter 16x10 Inches Length 21-41 Feet

6. SCREEN: Type none Size of Opening ______ Diameter ______ Inches Length ______ Feet

Range in Depth { Top ______ Feet, Bottom ______ Feet } Geologic Formation ______

Tail piece: Diameter ______ Inches Length ______ Feet

7. WELL FLOWS NATURALLY ______ Gallons per Minute at ______ Feet above surface

Water rises to ______ Feet above surface

8. RECORD OF TEST: Date Oct 20 1966 Yield 950 Gallons per minute

Static water level before pumping 24 Feet below surface

Pumping level 75 feet below surface after 73 hours pumping

Drawdown 51 Feet Specific Capacity 18.6 Gals. per min. per ft. of drawdown

How Pumped Turbine How measured Orific

Observed effect on nearby wells none

9. PERMANENT PUMPING EQUIPMENT:

Type ______ Mfrs. Name Owner to supply

Capacity ______ G.P.M. How Driven ______ H.P. ______ R.P.M. ______

Depth of Pump in well ______ Feet Depth of Footpiece in well ______ Feet

Depth of Air Line in well ______ Feet Type of Meter on Pump ______ Size ______ Inches

10. USED FOR Public supply AMOUNT { Average ______ Gallons Daily, Maximum ______ Gallons Daily }

11. QUALITY OF WATER Extra good Sample: Yes x No. ______

Taste no Odor no Color clear Temp. 54 °F

12. LOG 21 ~~21 hard pan Bal red rock 150-250 Best Veins~~ Samples available? yes
(Give details on back of sheet or on separate sheet. If electric log was made, please furnish copy)

13. SOURCE OF DATA Rinbrand Well Drilling Co Inc

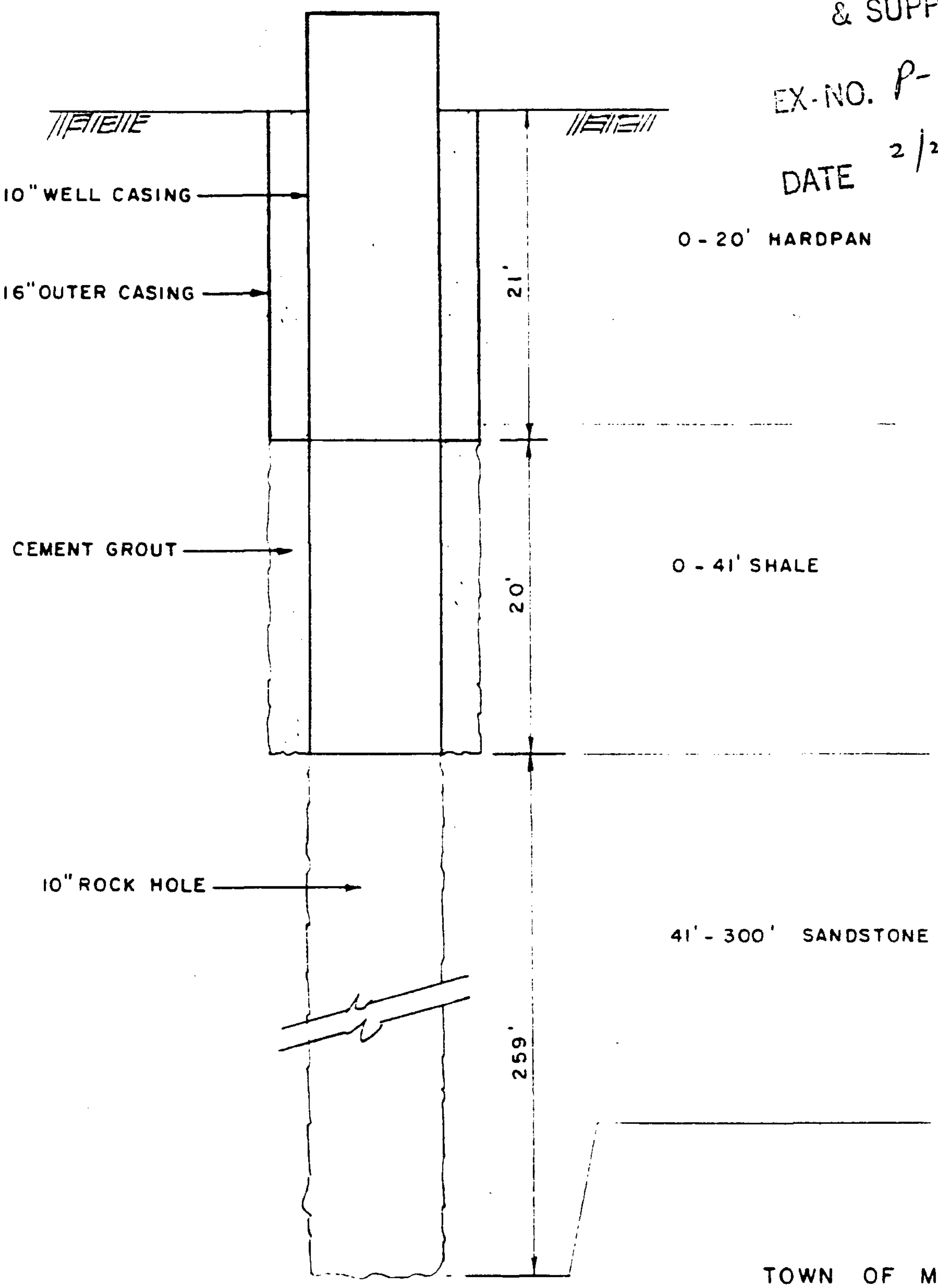
14. DATA OBTAINED BY Adam F Rinbrand Date Nov 11 1966

(NOTE: Use other side of this sheet for additional information such as log of materials penetrated analysis of the water, sketch map, sketch of special casing arrangements etc.)

DIV. WATER POLICY
& SUPPLY

EX-NO. P-3

DATE 2/27/67



TOWN OF MONTCLAIR
ESSEX COUNTY N.J.

SKETCH
OF
GLENFIELD WELL
NO SCALE

ELSON T. KILLAM ASSOCIATES, INC.
HYDRAULIC AND SANITARY ENGINEERS
MILLBURN, N. J.

FORM 87

DEPARTMENT OF CONSERVATION
AND ECONOMIC DEVELOPMENT
DIVISION OF WATER POLICY & SUPPLY

Permit No. 26-3687
Application No. 1331
County Essex

WELL RECORD

1. OWNER Montclair Water Bureau ADDRESS Chestnut &N Fullerton

Owner's Well No. ONE SURFACE ELEVATION ______ Feet (Above mean sea level)

2. LOCATION Montclair N.J.

3. DATE COMPLETED April 11 1966 DRILLER ~~Rinbrand Well Drilling Co Inc~~

4. DIAMETER: top 10 Inches Bottom 10 Inches TOTAL DEPTH 300 Feet

5. CASING: Type steel Diameter 16x10 Inches Length 16&36 Feet

6. SCREEN: Type none Size of Opening ____ Diameter ____ Inches Length ____ Feet

Range in Depth { Top ____ Feet, Bottom ____ Feet } Geologic Formation ______

Tail piece: Diameter ____ Inches Length ____ Feet

7. WELL FLOWS NATURALLY ____ Gallons per Minute at ____ Feet above surface

Water rises to ____ Feet above surface

8. RECORD OF TEST: Date April 11 1966 Yield 470 Gallons per minute

Static water level before pumping 19 Feet below surface

Pumping level 122 feet below surface after 84 hours pumping

Drawdown 103 Feet Specific Capacity ____ Gals. per min. per ft. of drawdown

How Pumped Turbine How measured Orific

Observed effect on nearby wells none

9. PERMANENT PUMPING EQUIPMENT: Owner to supply

Type ____ Mfrs. Name ____

Capacity ____ G.P.M. How Driven ____ H.P. ____ R.P.M. ____

Depth of Pump in well ____ Feet Depth of Footpiece in well ____ Feet

Depth of Air Line in well ____ Feet Type of Meter on Pump ____ Size ____ Inches

10. USED FOR Public supply AMOUNT { Average ____ Gallons Daily, Maximum ____ Gallons Daily }

11. QUALITY OF WATER ____ Sample: Yes ____ No. ____

Taste no Odor no Color clear Temp. 54 °F

12. LOG 9 clay,13 red shale,bal same Are samples available? yes

(Give details on back of sheet or on separate sheet. If electric log was made, please furnish copy)

13. SOURCE OF DATA Rinbrand Well Drilling Co Inc

14. DATA OBTAINED BY Adam F Rinbrand Date July 26 1966

FORM 87

DEPARTMENT OF CONSERVATION
AND ECONOMIC DEVELOPMENT
DIVISION OF WATER POLICY & SUPPLY

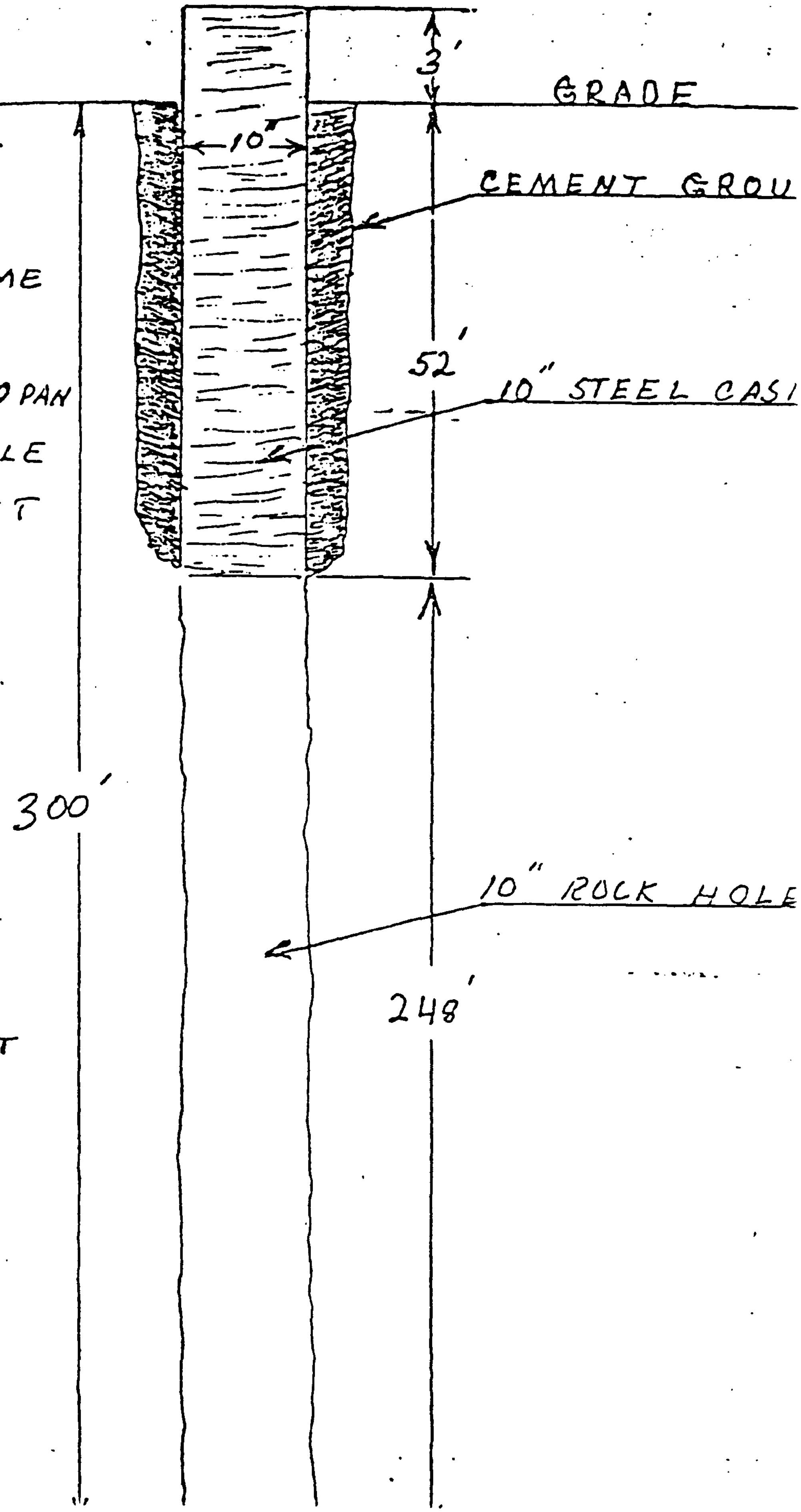
Permit No. 46-3684
Application No. ______
County Essex

WELL RECORD

1. OWNER Montclair Water Beaura ADDRESS Normal and Railroad
   Owner's Well No. Two SURFACE ELEVATION ______ Feet (Above mean sea level)
2. LOCATION Montclair N.J.
3. DATE COMPLETED June 7 1966 DRILLER Rinbrand Well Drilling Co Inc
4. DIAMETER: top 10 Inches Bottom 10 Inches TOTAL DEPTH 300 Feet
5. CASING: Type steel Diameter 16x10 Inches Length 40x60 Feet
6. SCREEN: Type none Size of Opening ______ Diameter ______ Inches Length ______ Feet
   Range in Depth { Top ______ Feet / Bottom ______ Feet } Geologic Formation ______
   Tail piece: Diameter ______ Inches Length ______ Feet
7. WELL FLOWS NATURALLY ______ Gallons per Minute at ______ Feet above surface
   Water rises to ______ Feet above surface
8. RECORD OF TEST: Date June 7 1966 Yield 10 Gallons per minute
   Static water level before pumping 15 Feet below surface
   Pumping level 200 feet below surface after 4 hours pumping
   Drawdown 185 Feet Specific Capacity ______ Gals. per min. per ft. of drawdown
   How Pumped Turbine How measured Pail
   Observed effect on nearby wells none
9. PERMANENT PUMPING EQUIPMENT:
   Type ______ Mfrs. Name NONE
   Capacity ______ G.P.M. How Driven ______ H.P. ______ R.P.M. ______
   Depth of Pump in well ______ Feet Depth of Footpiece in well ______ Feet
   Depth of Air Line in well ______ Feet Type of Meter on Pump ______ Size ______ Inches
10. USED FOR Publis Supply AMOUNT { Average ______ Gallons Daily / Maximum ______ Gallons Daily }
11. QUALITY OF WATER ______ Sample: Yes ______ No. ______
    Taste no Odor no Color clear Temp. 56 °F
12. LOG 30 clay,31 hard pan,bal red rock Are samples available? yes
    (Give details on back of sheet or on separate sheet. If electric log was made, please furnish copy)
13. SOURCE OF DATA Rinbrand Well Drilling Co Inc
14. DATA OBTAINED BY Adam F Rinbrand Date July 27 1966

26-4597

MONTCLAIR ...



0' - 4' LIGHT GRAY FINE SAND WITH SOME GRAY CLAY

4' - 7' RED HARDPAN

7' - 52' RED SHALE SOME VERY SOFT LAYERS.

52' - 300'

RED SHALE

SOME VERY SOFT LAYERS FROM 60' - 155'

REFERENCE NO. 13


SCALE 1:24000
CONTOUR INTERVAL 20 FEET
NATIONAL GEODETIC VERTICAL DATUM OF 1929
NUS CORPORATION
TITLE: THREE MILE VICINITY MAP
SITE: SERVOMETER CORPORATION, CEDAR GROVE, N.J.
DATE: 5/5/89
TDD: 02-8904-65
QUAD: ORANGE, N.J.
FIGURE NUMBER:
SCALE: 1"=2000'

REFERENCE NO. 14

SERVOMETER
CORPORATION

MINIATURE METAL BELLOWS
501 LITTLE FALLS RD. · CEDAR GROVE, N.J. 07009
(201) 785-4630

NJD002138543

April 21, 1987

RECEIVED
4/22

Ms. Lori Amato
USEPA - Region II
26 Federal Plaza
New York, N.Y. 10278

Dear Ms. Amato:

In accordance with the request of NJDEP's Frank Coolick in his 3/26/87 letter to Servometer Corporation, enclosed please find a copy of Servometer's Emergency Plan, Preparedness, Prevention and Contingency Plan (PPC), and the Hazardous Materials Training Manual.

You should retain this copy for use in the event of an emergency.

If there are any questions, please contact me.

Sincerely,

Servometer Corporation

Peter J. Holowachuk
President

PJH/jah

Enc.

SERVOMETER CORPORATION
EMERGENCY PLAN

This emergency plan has been prepared for Servometer Corporation by Lancy Laboratories, Division of Lancy International, Inc. in accordance with NJPDES Regulations, N.J.A.C. 7:14A-3.12. The emergency plan, which is required of DSW permit holders, is designed to insure effective operation of the facility under emergency conditions.

As provided in Section 3.12(a)1 of the NJPDES regulations, this emergency plan has been developed by addressing pertinent information contained in Servometer's Preparedness, Prevention, and Contingency (PPC) Plan (Attachment A) as well as their Hazardous Waste Training Program (Attachment B). The purpose of the emergency plan as well as the PPC Plan and Hazardous Waste Training Program is to minimize and/or abate hazards to human health and the environment resulting from accidents and mismanagement of hazardous materials, fires, explosions, emission or discharge of hazardous constituents to air, soil, surface or groundwater, and other emergency situations that may occur at the facility. Servometer Corporation has developed procedures for preventive action and is prepared to implement emergency-response procedures in the event of an emergency situation.

Emergency situations may include, but are not limited to those emergencies caused by natural disaster, civil disorder, sabotage, strike, faulty maintenance, negligent operation, or accident. Although all of these emergency situations are possible, an emergency caused by natural disaster, civil disorder, or sabotage cannot reasonably be expected to occur at the Servometer facility. Therefore, emergency situations related to strike, faulty equipment, poor maintenance, negligent operation, or accidents will be primarily addressed as to their effects on the following:

- Power Supply
- Communication
- Equipment
- Supplies
- Personnel
- Security, and
- Emergency Procedures

Power Supply: As discussed in the PPC Plan, External Factors (Page 15), Servometer Corporation should be minimally affected, from a safety standpoint, by a power outage. During a power outage, production in all departments would cease. Emergency flood lights are available for adequate lighting to shut-down production processes and an emergency telephone system exists to contact outside assistance, if needed.

Communication: As discussed in the PPC Plan, Internal and External Communications or Alarm Systems (Page 16), the Servometer facility is presently equipped with sufficient communication and alarm systems to provide immediate emergency instruction to facility personnel and to summon outside assistance.

Equipment: Emergency situations that arise from faulty maintenance or improper operation of equipment may occur within the Plating Department and/or the Wastewater Treatment Area. These areas are designed to collect any spillage and/or leakage from damaged equipment.

Routine inspections of facility equipment are conducted to identify and remedy any potential emergency situation.

Emergency-response equipment is available at Servometer to allow personnel to respond safely and quickly to emergency situations. Emergency Equipment (Page 24) of the PPC Plan, identifies the emergency equipment available at the facility.

Supplies: As discussed in the PPC Plan, Raw Material and Waste Inventory (Page 4), Servometer maintains a complete inventory of all potentially hazardous chemical supplies including raw materials, process materials, and wastewater treatment chemicals. Spills and/or leaks resulting from negligent operations or accidents would be contained within the specific areas where the materials are stored.

Personnel: As discussed in the PPC Plan, Employee Training Program (Page 17), all Servometer Corporation personnel are given training to enable them to understand the processes and materials with which they work, associated safety and health hazards, and practices for preventing and responding to emergency situations. The Hazardous Waste Training Program (Attachment B) emphasizes training in emergency procedures and use of emergency equipment. In addition, as presented in the PPC Plan, personnel are informed about Inspection and Monitoring (Page 12), Material Compatibility (Page 11), and Housekeeping Practices (Page 13).

Security: Security procedures during an emergency situation would be the same as during a non-emergency situation. As discussed in the PPC Plan, Security (Page 14), Servometer maintains a complete facility alarm system equipped with photo electric light beam sensors. Additional security measures include adequate lighting, locked entrances, and warning signs.

Emergency Procedures: In the event of an emergency situation, Servometer Corporation would implement their PPC Plan. Specific emergency procedures including duties and responsibilities of emergency coordinators are outlined in the Plan and include the following sections:

- List of Emergency Coordinators (Page 18)
- Duties and Responsibilities of the Emergency Coordinator(s) (Page 19)
- Chain of Command (Page 22)
- List of Agencies to be Notified (Page 23)
- Evacuation Plan for Facility Personnel (Page 25)
- Arrangements with Emergency Response Contractors (Page 26)

PREPAREDNESS, PREVENTION, AND CONTINGENCY PLAN

SERVOMETER CORPORATION
501 LITTLE FALLS ROAD
CEDAR GROVE, NEW JERSEY

MAY 1984

LANCY LABORATORIES
DIVISION, LANCY INTERNATIONAL, INC.

TABLE OF CONTENTS

ATTACHMENTS

The Preparedness, Prevention, and Contingency (PPC) Plan contained within has been prepared for Servometer Corporation by Lancy Laboratories, a Division of Lancy International, Inc., under Project No. 001712. This PPC Plan has been prepared and submitted in accordance with the New Jersey Hazardous Waste Management Regulations, Title 7, Chapter 26.

May, 1984

INTRODUCTION

This Preparedness, Prevention, and Contingency (PPC) Plan was prepared in compliance with the New Jersey Hazardous Waste Management Regulations (N.J.A.C. 7:26-9.7) and Federal RCRA Regulations.

The purpose of the Plan is to minimize and abate hazards to human health and the environment from fire, explosion, emission or discharge of hazardous waste or hazardous waste constituents to air, soil, surface water, or groundwater. The Plan contains procedures for preventive actions as well as emergency procedures in the event of an accident. Employees are given training in all aspects of the PPC Plan so that preventive and emergency procedures are carried out in an effective and coordinated manner. In addition, the Plan has been reviewed with local emergency response agencies to familiarize them with the facility and its operations.

GENERAL DESCRIPTION OF INDUSTRIAL ACTIVITY

At its Cedar Grove, New Jersey facility, the Servometer Corporation manufactures miniature metal bellows, bellows assemblies, couplings and contacts for the aerospace and control valve industries. Basically, the manufacturing operation involves the electrodeposition (electroforming) of copper and nickel onto aluminum mandrels. Once the desired thickness is obtained, the aluminum mandrels are dissolved using a caustic solution.

Servometer operates a wastewater treatment system on-site which treats various spent process solutions containing dissolved metals, acids, alkalies, and cyanides. The system also treats rinse waters which flow continuously while the plant is operating. These rinsewaters represent a more voluminous but less concentrated source of wastes as compared to the process solutions. The effluent from the treatment system is discharged to the Peckman River under New Jersey Pollutant Discharge Elimination System (NJPDES) permit #NJ0027847.

The Servometer Corporation is classified as a hazardous waste treatment, storage, and disposal (TSD) facility-EPA I.D. #NJD002138543. Hazardous wastes generated by the facility include: caustic waste (D002), waste acid (D002), still bottoms from solvent (TCE) recovery unit (F001), wastewater treatment sludge (F006), and waste metal working oils (X726). All hazardous wastes are removed from the site within ninety (90) days of generation.

ORGANIZATIONAL STRUCTURE FOR IMPLEMENTATION OF THE PPC PLAN

Implementation of the PPC Plan is the responsibility of the PPC Plan Committee. This Committee consists of the following employees:

Peter J. Holowachuk, President - Coordinator

Jayne A. Holowachuk, Vice President/Treasurer - Assistant Coordinator

Kurt Haag, General Manager - Assistant Coordinator

Louis Fejes, Assistant General Manager - Assistant Coordinator

The coordinator will have the primary responsibility for implementing the plan. At his direction, the assistant coordinators will aid in carrying out the following duties and responsibilities of the committee:

- Establish employee training programs which familiarize employees with the PPC Plan.
- Identify materials and wastes handled.
- Conduct visual inspections.
- Review and document past incidents and spills.
- Identify potential spill sources.
- Establish spill-reporting procedures.
- Coordinate spill cleanup activities.
- Notify appropriate authorities when a spill has occurred.
- Review new construction and process changes at the plant relative to the PPC Plan.
- Review and evaluate at regular intervals, the effectiveness of the PPC Plan and institute changes where necessary.

DESCRIPTION OF EXISTING EMERGENCY RESPONSE PLANS

This PPC plan is the first formal emergency response plan developed by Servometer Corporation for its Cedar Grove facility. Past emergency response practices have been reviewed, updated, and included in this comprehensive plan.

RAW MATERIAL AND WASTE INVENTORY

A complete inventory of all potentially hazardous chemical substances located at the plant has been compiled and documented in Table 1. This list is used to identify substances which have the potential for causing environmental degradation or endangerment of human health and safety through accidental releases.

Chemical substances located at the plant can be divided into four categories: raw materials, process materials, wastewater treatment chemicals, and waste materials. General information on materials in each of these categories is provided in Table 1. This table includes information concerning storage location, use in manufacturing operations, and storage volume. Although the plant has numerous process test reagents, they represent a small volume of overall chemical usage. In addition to the information provided in Table 1, chemical storage and usage areas are identified on a plant schematic in Attachment 1. Material safety data sheets are available to all employees who come into contact with these chemicals.

TABLE 1

RAW MATERIAL AND WASTE INVENTORY

A. RAW MATERIALS

Name	Location	Use	Storage Volume
Copper Cyanide	Plating Dept.	Plating Bath	100 lbs.
Nickel Sulfamate	Plating Dept.	Plating Bath	55 gal.
Nickel Chloride	Plating Dept.	Plating Bath	10 gal.
Aluminum	Machine Shop	Basis Metal	600 Lbs.
Stainless Steel	Machine Shop	Basis Metal	150 Lbs.

. . . .

B. PROCESS MATERIALS

Name	Location	Use	Storage Volume
1,1,1-trichloroethane	Cleaning Room	Degreasing	275 gal.
Sodium Hydroxide	Machine Shop	Dissolution of Aluminum Mandrels	2400 lbs.
Nitric Acid	Plating Dept.	Dissolution of Nickel from Aluminum Mandrel	60 gal.

. . . .

TABLE 1 (Continued

C. WASTEWATER TREATMENT CHEMICALS

Name	Use	Storage Volume
Calcium Hydroxide	pH adjustment	500 lbs.
Sodium Metabisulfite	Chromium reduction module	100 lbs.
Sulfuric Acid	pH adjustment	60 gal.
Sodium Hypochlorite	Cyanide oxidation module	100 gal.
Inhibitor LD	Cyanide oxidation module	5 gal.
Diphenylcarbazide Indicator	Chromic Acid spot test reagent	50 grams
Acetic Acid	Chromic Acid spot test reagent	500 ml.
Thycdene Indicator AR-16	Available chlorine titration test	2 pints
Sodium Thiosulfate	Available chlorine titration test	2 pints
Phenolphthalein Indicator	Cyanide spot test	50 cc.
Sodium Carbonate, anhydrous	Cyanide spot test	5 lbs.
Ammonium Hydroxide	Nickel spot test	100 cc.
Dimethylglyoximic Indicator	Nickel spot test	100 cc.
Potassium Iodate	Nickel spot test	100 cc.
Sodium Acetate	Copper spot test	200 cc.
Glacial Acetic Acid	Copper spot test	500 ml.
Methyl Alcohol	Copper spot test	1 pint
Sodium Nitrate	Copper spot test	200 cc.

. . . .

TABLE 1 (Continued)

D. WASTE MATERIALS

Waste Name	Source	H.W. Classification	Max. Storage Volume
Caustic Waste	Dissolution of Aluminum from Nickel parts	D002	6000 gal.
Waste Acid	Dissolution of	D002	330 gal.
TCE Still Bottoms	Degreasing unit	F001	275 gal.
Wastewater Treatment Sludge	Wastewater Treatment System	F006	1400 gal.
Waste Oil	Metal Working	X726	300 gal.

SPILL AND LEAK PREVENTION AND RESPONSE

Areas where spills and leaks of potentially dangerous chemicals may occur have been identified so that particular attention can be given to appropriate pollution incident prevention measures. The following areas have been identified as the major areas where potential spills may occur:

- Caustic Waste Storage Tank: The caustic waste generated from the dissolution of aluminum from nickel plated parts is currently stored in a 6000 gallon underground fiberglass tank. The tank is located beneath part of the driveway along the north side of the plant. If a leak were to develop in this tank, it would create a potential for soil and groundwater contamination. In order to prevent this situation from occurring, Servometer intends to close the underground tank and replace it with an above ground system. The above ground system will be equipped with an automatic shut-off valve to prevent overfilling of the tank. It will also be easier to test and inspect the above ground system to prevent potential leaks from developing.

- <u>Waste Acid Generated in the Plating Department</u>: If a spill or leak should occur from the sulfuric acid bath used in the Plating Department, it would drain to the floor trough and be contained. From the floor trough it would be pumped to batch treatment in the waste treatment area. The Plating Department is under constant supervision and any potential for leak development would be identified and remedied before leading to an emergency situation.

- <u>1,1,1-Trichloroethane Unit</u>: A solvent vapor degreaser is in the Cleaning Room. Solvent is recycled in a closed loop within the unit. This minimizes the potential for a release of 1,1,1-Trichloroethane. Still bottoms from the unit are routinely removed by a hazardous waste hauler.

- <u>Plating Baths in the Plating Department</u>: The floors in the plating areas are designed to collect any spillage and leakage and collect it in the floor spill sump. A sump pump will automatically transfer the floor spill to the batch treatment tank where it will be carefully tested and treated before discharge. The design of this system is such that no accidental discharges to the floor areas can find their way into the rinse water effluent and be diluted rather than treated prior to discharge.

- Wastewater Treatment Area: If an unwanted discharge of treatment chemicals or waste residue occurs in this area, it will collect in a floor spill sump. The spilled material will automatically be transferred to a batch treatment tank before discharge.

MATERIAL COMPATABILITY

Under normal conditions, materials used within the various production areas are compatable. The one exception is in the Plating Department where chlorine and cyanide in the Integrated Cyanide Treatment System can potentially generate a poisonous gas.

The Integrated Cyanide Treatment System is of the alkaline chlorination type designed to completely oxidize highly toxic cyanide into harmless carbon dioxide and nitrogen. This system consists primarily of a treatment rinse tank located in the plating line and a treatment solution reservoir located in the waste treatment area. The arrangement of the equipment is such as to provide for the addition of treatment chemicals to the treatment reservoir and recirculate the treatment solution between the reservoir to the treatment rinse tank. To provide satisfactory treatment, the treatment solution is maintained at a strength of 800 to 1200 ppm available chlorine and at a pH of 11.5-12.8.

Chlorine in contact with cyanide under the condition of depressed pH gives rise to the formation of toxic hydrogen cyanide and/or cyanogen chloride gases. Therefore, the pH of the treatment system is never allowed to fall below 9.5. In fact, it is automatically maintained at 12.5.

INSPECTION AND MONITORING PROGRAM

A documented inspection schedule, separate from Servometer's PPC plan, has been prepared in accordance with the New Jersey Hazardous Waste Management Regulations. Information in this plan includes: a schedule of equipment and areas to be inspected; frequency of inspection; information to be recorded in an inspection log; copies of the inspection log sheets; and procedures to initiate corrective actions when problems are identified.

In addition to maintaining a documented copy of the program at the facility, a copy is on file with the New Jersey Department of Environmental Protection. Similar to the PPC Plan, the inspection schedule is reviewed periodically and updated to correspond with facility changes.

PREVENTIVE MAINTENANCE/HOUSEKEEPING

The focus of the preventive maintenance program and good housekeeping practices is to eliminate conditions that could lead to accidental spills and safety hazards to plant personnel. In addition to addressing problems identified through the Inspection and Monitoring Program, the plant manager maintains a routine housekeeping program which includes:

- Familiarizing employees with appropriate preventive maintenance procedures for their particular work area.

- Assuring that work areas are kept clean and free of debris.

- No Smoking signs are placed in appropriate places.

- Assuring that correct labeling and placarding exists on all containers, process areas, work stations, buildings, exits, and entry points throughout the plant.

- Documenting preventive maintenance inspection activities on the appropriate inspection log forms and maintaining them in the Facility Operating Record.

SECURITY

The regulations require that Servometer Corporation maintain security by minimizing the possibility for unauthorized entry by persons or livestock onto the active portion of the facility.

To meet these objectives, Servometer installed an alarm system which is tied in with all entrances. The system is also equipped with photo electric light beam sensors. At night, the facility is well lit both inside and out.

The facility operates 5 days/week, 24 hours/day. During working hours, all entrances and exits, except the main entrance, are locked. All visitors must register at the front entrance and be accompanied by a Servometer employee while in the facility. Warning signs are posted at the Plating Department entrances to ensure entry by authorized personnel only. During non-working hours, all entrances and exits are locked and a chain is secured across the driveway entrance.

EXTERNAL FACTORS

Servometer Corporation should be minimally affected, from a safety standpoint, by external factors such as power outages, adverse weather condictions, and strikes. These factors are more likely to affect production output rather than safety.

During a power outage, production in all departments would cease. An extended power outage could cause serious losses of work-in-process in the Plating Department. Plating tanks are normally run 24 hours, 7 days per week for filtration purposes. A power outage would, therefore, affect the quality of the plating solution.

Although no emergency generator currently exists for long-term back up, Servometer is equipped with emergency flood lights and an emergency telephone system. In the event of a power outage, adequate lighting would exist to safely shut down production processes. The emergency phone system would be used to contact the power company and to call for other assistance if needed.

INTERNAL AND EXTERNAL COMMUNICATIONS OR ALARM SYSTEMS

The facility is equipped with sufficient communication and alarm systems to provide immediate emergency instruction to facility personnel and to summon external assistance. Telephone and alarm systems are functional during power outages.

EMPLOYEE TRAINING PROGRAM

All Servometer Corporation employees are given training to enable them to understand the processes and materials with which they are working, safety and health hazards, and practices for preventing and responding to spills. The program emphasizes training in emergency procedures and use of emergency equipment.

As required by the regulations, the Personnel Training Program is a documented program. In addition to training in emergency procedures, the training program covers other aspects of the PPC Plan such as inspection and monitoring, material compatability and housekeeping practices. Training records are also maintained which document specific employee training.

LIST OF EMERGENCY COORDINATORS

A primary coordinator and alternates have been designated the responsibility of coordinating activities during an emergency as specified in the following section. The Emergency coordinators for Servometer Corporation include:

Peter J. Holowachuk, President - Primary Coordinator

201/785-4630 (office)

201/839-3597 (home)

Jayne A. Holowachuk, Vice President-Treasurer - Alternate Coordinator

201/785-4630 (office)

201/934-6627 (home)

Louis Fejes, Assistant General Manager - Alternate Coordinator

201/785-4630 (office)

201/697-6174 (home)

Brian Itjen, Plating Foreman - Alternate Coordinator

201/785-4630 (office)

201/785-1297 (home)

At least one of these employees will be either on-site or on-call at all times. They are familiar with all aspects of the PPC Plan and have the authority to commit the resources necessary to carry out the PPC Plan.

DUTIES & RESPONSIBILITIES OF THE EMERGENCY COORDINATOR(S)

At all times, one of the emergency coordinators is either at the facility or on call. The emergency coordinator is familiar with all aspects of the facility's PPC plan, operations and activities at the facility, the location and characteristics of waste handled, the location of all records within the facility, and the facility layout. In addition, the coordinator has the authority to commit the resources needed to carry out the PPC plan.

In the event of an emergency, the emergency coordinator will immediately:

1. activate facility alarms or communication systems to notify all facility personnel; and
2. notify local emergency response agencies if their help is needed.

Whenever there is a fire, explosion, emission, or discharge, the emergency coordinator will immediately identify the character, exact source, amount, and areal extent of any released materials. Concurrently, the emergency coordinator will assess possible hazards both direct and indirect, to human health or the local environment.

If the emergency coordinator determines that the facility has had an incident which could threaten human health or the environment, he will report his findings as follows:

1. If his assessment indicates that evacuation of local areas may be advisable, he will immediately notify appropriate local authorities. He will be available to help appropriate officials decide whether local areas should be evacuated; and

2. He will immediately notify the NJ Department of Environmental Protection (DEP) by telephone at 609/292-7927 and the National Response Center at 800/424-8802. Following the incident, a report concerning the event and any remedial actions taken will be prepared and will include the following information:

   A. Name of the person reporting the incident.

   B. Name, address, and identification number of facility.

   C. Phone number where the person reporting the spill can be reached.

   D. Date, time, and location of the incident.

   E. A brief description of the incident including type of incident, nature of hazardous material involvement and possible hazards to human health or the environment.

   F. The extent of injuries, if any.

   G. For each material involved in the incident, the shipping name, hazard class, and quantity of the waste involved.

The report will be maintained in the Facility Operating Record within the Hazardous Waste Control files and updated into the PPC Plan on an annual basis.

During an emergency, the emergency coordinator will take all reasonable measures necessary to ensure that fire, explosion, emissions, or discharges do not occur, recur, or spread to other hazardous materials at the facility.

These measures will include, where applicable, stopping processes and operations, collecting and containing discharged waste, and removing or isolating containers. If the facility stops operations the emergency coordinator will monitor for leaks, pressure buildup, gas generation, ruptures in valves, pipes, or other equipment, where applicable.

Immediately after an emergency, the emergency coordinator will, with DEP approval, provide for treating, storing, or disposing of recovered waste, contaminated soil or surface water, or other materials destroyed by or associated with the contingency.

The emergency coordinator will ensure that, in the affected area of the facility:

1. No waste that may be incompatible with the emitted or discharged material is treated, stored, or disposed of until cleanup procedures are completed; and

2. All emergency equipment listed in the PPC plan is cleaned, replaced, if necessary, and fit for its intended use before operations are resumed.

CHAIN OF COMMAND

In the event of an emergency or spill, the following employees should be contacted:

Peter J. Holowachuk, President

Office phone: 201/785-4630

Home phone: 201/839-3597

Jayne A. Holowachuk, Vice President-Treasurer

Office phone: 201/785-4630

Home phone: 201/934-6627

Louis Fejes, Assistant General Manager

Office phone: 201/785-4630

Home phone: 201/697-6174

Brian Itjen, Plating Foreman

Office phone: 201/785-4630

Home phone: 201/785-1297

LIST OF AGENCIES TO BE NOTIFIED

In the event of an emergency or spill, the following local, state, and federal agencies may be notified. In the event of a major spill, at a minimum, the National Response Center and the New Jersey Department of Environmental Protection should be notified.

* o Cedar Grove Police, Fire, and Ambulance Service

  201/239-4100

o Local Hospitals

  - Passaic General Hospital

    201/365-4377

  - St. Mary's Hospital

    201/473-1000

* o New Jersey Department of Environmental Protection

  609/292-7927

  609/292-5500

* o United States Environmental Protection Agency - Region II

  212/264-0980

o National Response Center

  800/424-8802

o Suburban Essex Area Poison Control Center

  201/992-5161

*These organizations retain a copy of the PPC Plan for use in the event of an emergency.

EMERGENCY EQUIPMENT

Emergency equipment is available to allow personnel to respond safely and quickly to emergency situations. Through the Personnel Training Program, employees are instructed on the availability, location, and use of emergency equipment. The following emergency equipment is provided by Servometer Corporation:

Equipment	Quantity
o Portable fire extinguishers	17
o Ladders	3
o Stretcher	1
o Portable lighting equipment	1
o First aid kits	3
o Self-contained breathing apparatus	1
o Welding/cutting equipment	1
o Portable pump	1
o Chain hoist	2
o Crane	1

EVACUATION PLAN FOR FACILITY PERSONNEL

The emergency coordinator on duty is responsible for determining when a facility evacuation is necessary.

Personnel have been instructed on evacuation procedures through the Personnel Training Program. Evacuation plans are posted in each department and include a diagram showing the route and exit to be used in case of an emergency.

ARRANGEMENTS WITH EMERGENCY RESPONSE CONTRACTORS

The following Contractors are available to assist with the clean-up and disposal of hazardous substances in the event of an emergency. Although not required, most emergency response contractors prefer prior contact to provide information about the hazardous waste facility to enhance emergency preparedness. A brief description of the services provided and area served is provided below:

1. Advanced Environmental Technology Corporation (AETC)

   24 hour Emergency Number - 201/347-7111

   Contact - Andy Babij

   AETC, located in Flanders, New Jersey, provides emergency clean-up and disposal services for any hazardous wastes including highly explosive materials. A staff of field technicians are on call 24 hours a day. Some of the equipment available includes a full range of personal protective equipment, material transfer and handling equipment and vacuum trucks. The major service area for AETC is New Jersey, Connecticut, Pennsylvania, Massachusetts, New York, Deleware, and Maryland.

2. SCA Services

24 hour Emergency Number - 201/465-9100

Contact - Chuck Boerner

SCA Services is a licensed hazardous waste disposal facility located in Newark, New Jersey. SCA does not routinely handle complete emeregency response cases, however, they will provide these services on a case by case basis, depending upon the type of materials involved and environmental component involved.

3. O. H. Materials Inc.

24 hour Emergency Number - 800/537-9540

Contact - No specific contact required

O. H. Materials Inc. is a large-scale emergency response contractor with emergency team offices in 31 wide spread states. This outfit will clean-up and dispose of any hazardous material, including radioactive wastes. Service agreements are available to enhance preparedness but are not required.

4. Triangle Resource Industries

24 hour Emergency Number - 800/638-4442 (work hours)
800/638-4440 (after hours)

Contact - Walt Petzold

Triangle Resources Industries provide disposal services for Pack Laboratory Chemicals (PLC) in New Jersey and the surrounding states. Services include Pack, removal, and disposal of all types of laboratory chemicals.

POLLUTION INCIDENT HISTORY

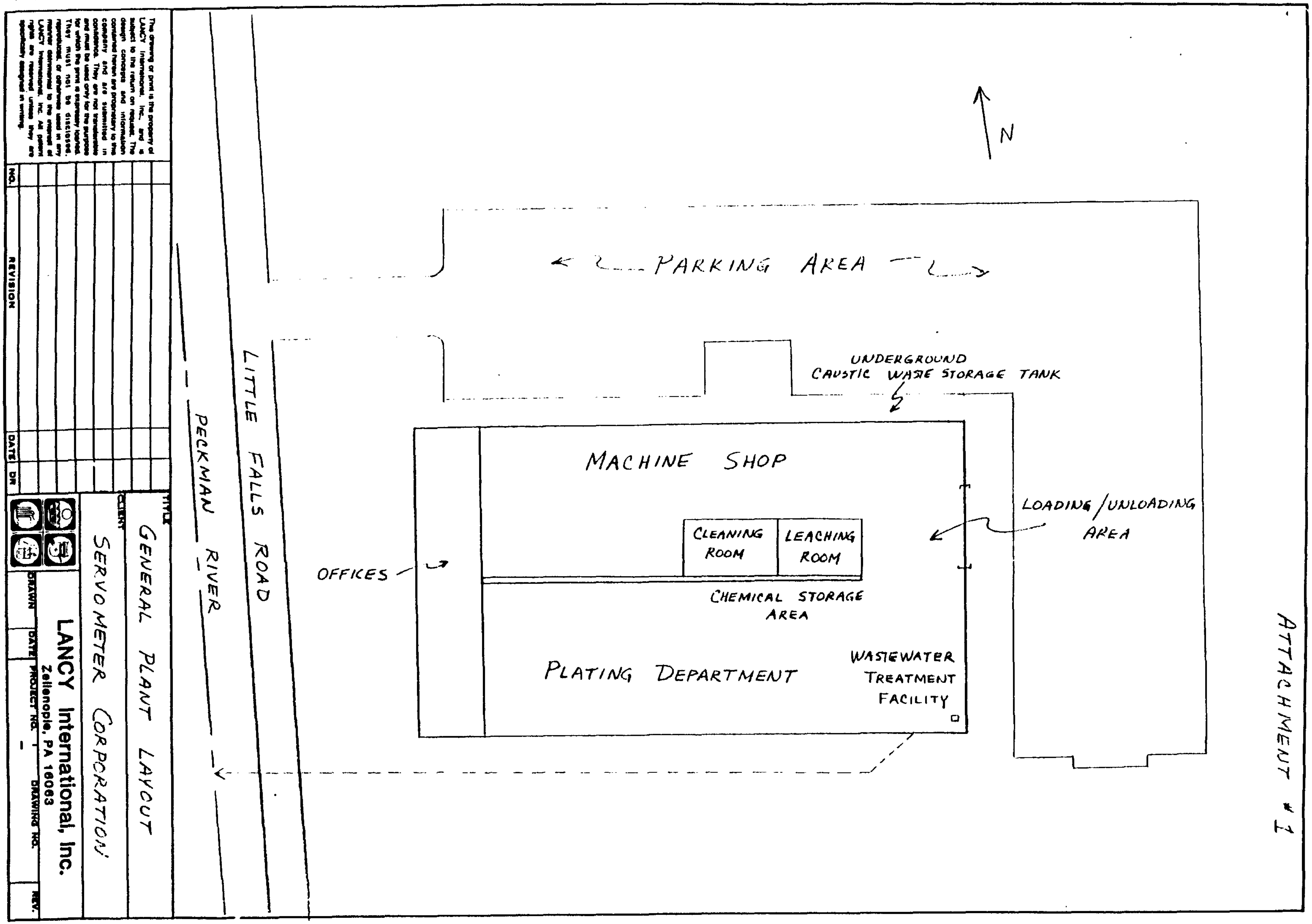
To date, there have not been any pollution incidents at Servometer Corporation. If any incidents occur in the future, they will be documented and incorporated into the Personnel Training Program so as to avoid a similar situation from occurring.

PPC PLAN REVIEW

During the month of May each year, the PPC Plan will be reviewed by members of the PPC Plan Committee. The appropriate modifications will be made to reflect changes in plant operations or materials handling procedures.

In the space provided below, an authorized designate of the review committee must document that the review took place by signing his name and the date the review took place.

Authorized Signature	Review Date
1. Peter J. Holowachuk	4-20-87
2. Jayne A. Holowachuk	4/20/87
3. Laurie Fay	4/20/87
4. Bruce [illegible]	4.20.87
5.	
6.	
7.	
8.	



N
PARKING AREA
UNDERGROUND
CAUSTIC WASTE STORAGE TANK
MACHINE SHOP
CLEANING ROOM
LEACHING ROOM
LOADING/UNLOADING AREA
OFFICES
CHEMICAL STORAGE AREA
PLATING DEPARTMENT
WASTEWATER TREATMENT FACILITY
LITTLE FALLS ROAD
PECKMAN RIVER
ATTACHMENT #1
NO.
REVISION
DATE
DR
TITLE
GENERAL PLANT LAYOUT
CLIENT
SERVOMETER CORPORATION
LANCY International, Inc.
Zelienople, PA 16063
DRAWN
DATE
PROJECT NO.
DRAWING NO.
REV.

REFERENCE NO. 15

NUS CORPORATION TELECON NOTE

CONTROL NO: 02-8904-65	DATE: 5/10/89	TIME: 1530

DISTRIBUTION: SERVO METER CORPORATION FILE

BETWEEN: MR. DEBLOCK	OF: WEST PATERSON WATER POLLUTION CONTROL	PHONE: (201) 256-1230

AND: P. SOLINSKI (NUS)

DISCUSSION:

RE: USES OF THE PASSAIC RIVER DOWNSTREAM OF THE PASSAIC VALLEY WATER COMMISSION INTAKE AT LITTLE FALLS.

He stated that he knew of very few uses of the river. He said that downstream water is used for hydroelectric power generation in Paterson (at the Great Falls) and in Garfield or Passaic as well. He said that there may be some recreational fishing use.

He also knew of ~~a~~ no wetlands downstream on the Passaic.

ACTION ITEMS:

NUS 067 REVISED 0681

REFERENCE NO. 16

TERRESTRIAL ORGANISMS

Shown in BROWN; species with special status shown in RED-(F) or (S) indicates species protected by Federal or State Legislation (see text)

SYMBOL SPECIES

PLANTS (301-350)

301 Eastern hemlock
302 Spleenwort (S)
303 Spider lily (S)
304 Pond bush (S)
305 Watermilfoil (S)
306 Hooded pitcher plant (S)
307 Tree
308 Prickly pear cactus (S)
309 Trailing arbutus (S)
310 Eastern bumelia
311 Pitcher plant
312 Baldcypress
313 Redbay
314 Seaside alder
315 Box huckleberry
316 Purple fringeless orchid
317 Pink lady's slipper
318 Ebony spleenwort (S)
319 Orchids (S)
320 Golden club (S)
321 Florida beargrass
322 East-coast coontie
323 Fall-flowering ixia
324 Jackson-vine
325 Spoon-flower
326 Curtiss milkweed
327 Sea lavender
328 Hand fern
329 Needle palm
330 Yellow squirrel-banana
331 Beach creeper
332 Florida coontie
333 Four-petal pawpaw
334 Bird's nest spleenwort
335 Burrowing four-o'clock
336 Beach star
337 Silver palm
338 Dancing lady orchid
339 Tamarindillo
340 Fuch's bromeliad
341 Everglades peperomia
342 Buccaneer palm
343 Slender spleenwort
344 Pineland jacquemontia
345 Mahogany mistletoe
346 Florida thatch
347 Twisted air plant
348 Long's bittercress
349 Venus's flytrap

INVERTEBRATES (351-400)

351 Monarch butterfly
352 Zebra butterfly

BIRDS (401-600)

SHOREBIRDS (401-430)

401 Shorebirds
402 Terns
403 Gulls
404 Forster's tern
405 Arctic tern
406 Least tern (S)
407 Roseate tern (S)
408 Common tern
409 Great black-backed gull
410 Herring gull
411 Laughing gull
412 Black skimmer (S)
413 Turnstones
414 Plovers
415 Piping plover
416 American oystercatcher (S)

WADING BIRDS (431-460)

431 Wading birds
432 Herons
433 Egrets
434 Rails
435 Ibises
436 Bitterns
437 Great blue heron (S)
438 Wood ibis (S)
439 Anhinga
440 Little blue heron (S)
441 Yellow-crowned night heron (S)
442 Black-crowned night heron
443 Florida sandhill crane (S)
444 Louisiana heron (S)
445 Limpkin (S)
446 Roseate spoonbill (S)
447 Snowy egret (S)
448 Magnificent frigate-bird (S)
449 Reddish egret (S)
450 Clapper rail
451 King rail
452 Virginia rail
453 Sora rail

WATERFOWL (461-500)

461 Waterfowl
462 Swans
463 Geese
464 Dabbling ducks
465 Diving ducks
466 Common eider
467 Harlequin duck
468 Wood duck
469 Fulvous tree duck
470 Loons

40074-A1-EI-250

Newark

N. J.—N. Y.—PA.

69-805- - -

GEOSTAT MAP & TRAVEL CENTERS

11 $ 4.95

1:250 000-scale map of

Atlantic Coast Ecological Inventory

Produced by U. S. FISH AND WILDLIFE SERVICE 1980

AQUATIC ORGANISMS

Shown in BLUE; species with special status shown in RED(F) or (S) indicates species protected by Federal or State Legislation (see text)

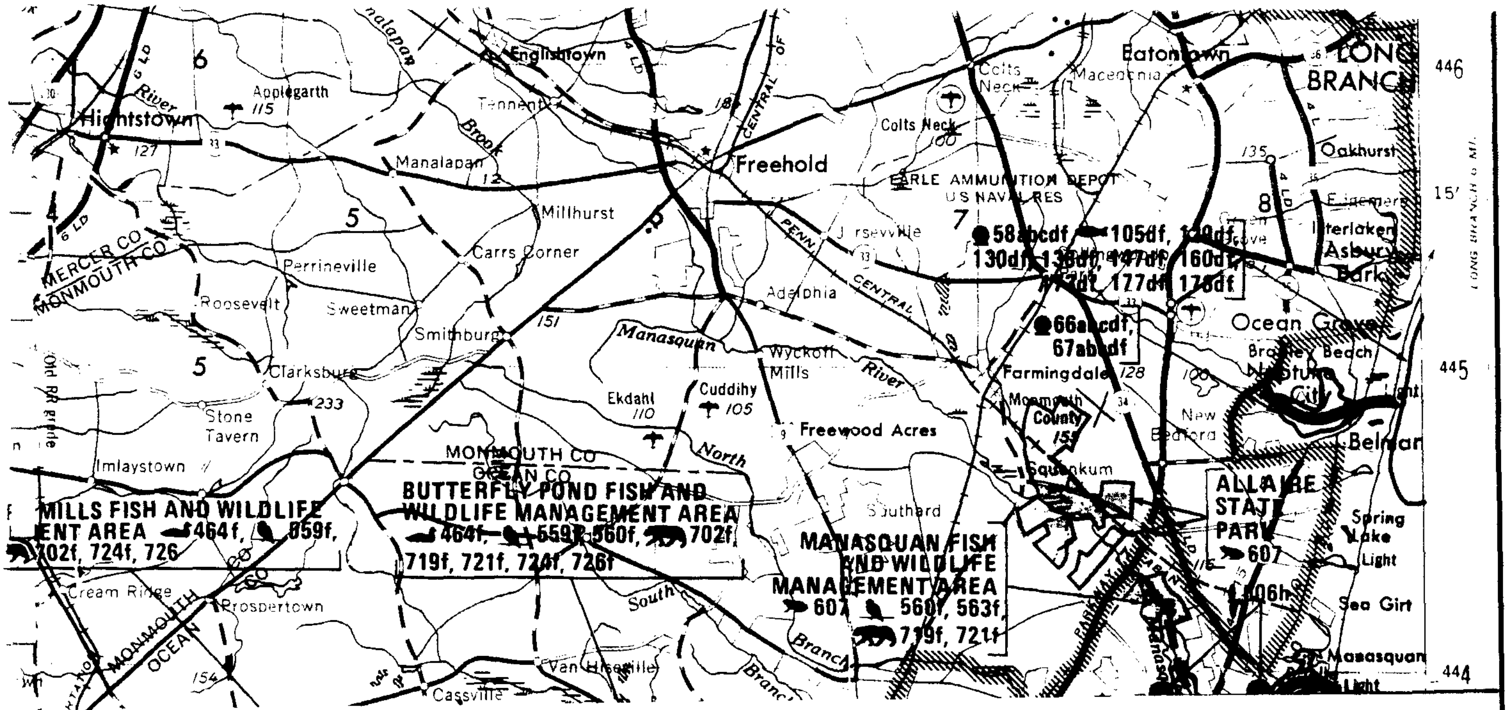
SYMBOL SPECIES

PLANTS (1-50)

1 Irish moss
2 Rockweed

INVERTEBRATES (51-100)

51 Crabs
52 Mussels
53 Oysters
54 Scallops
55 Clams
56 Worms
57 Shrimp
58 American lobster
59 Blue crab
60 Eastern oyster
61 European oyster
62 Bay scallop
63 Deep-sea scallop
64 Calico scallop
65 Surf clam
66 Hard clam
67 Soft shell clam
68 Brackish-water clam



Scale 1:250,000

5 0 5 10 15 Statue Miles 20

5 0 5 10 15 20 25 Kilometres 30

5 0 5 10 Nautical Miles 15

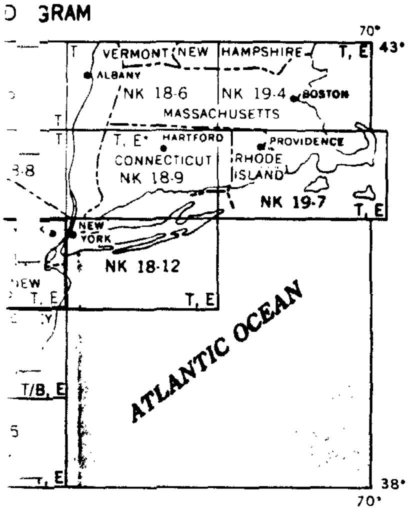
TRANSVERSE MERCATOR PROJECTION

BLACK NUMBERED LINES INDICATE THE 10,000 METRE UNIVERSAL TRANSVERSE MERCATOR GRID, ZONE 18

FOR SALE BY U. S. GEOLOGICAL SURVEY, RESTON, VIRGINIA 22092, OR DENVER, COLORADO 80225

40°00′ 74°00′ 30′ 15′ 3 000 000 FEET (PA. SOUTH)

PHILADELPHIA 47 MI. PLEASANTVILLE 47 MI.



LAND USE–LAND COVER SYMBOLS

Study area (coastal zone boundary to three-mile limit)

Special land use areas, including refuges and wildlife management areas, parks and seashores; may be used in lieu of habitat boundary

Subdivision of a special land use area into more than one designation

Swamp

Marsh

Beach/Dunes

Seagrass

Reef

POINT AND AREA FEATURE SYMBOLS

(shown in RED for species with special status; shown in BLUE for aquatic organisms; and shown in BROWN for terrestrial organisms)

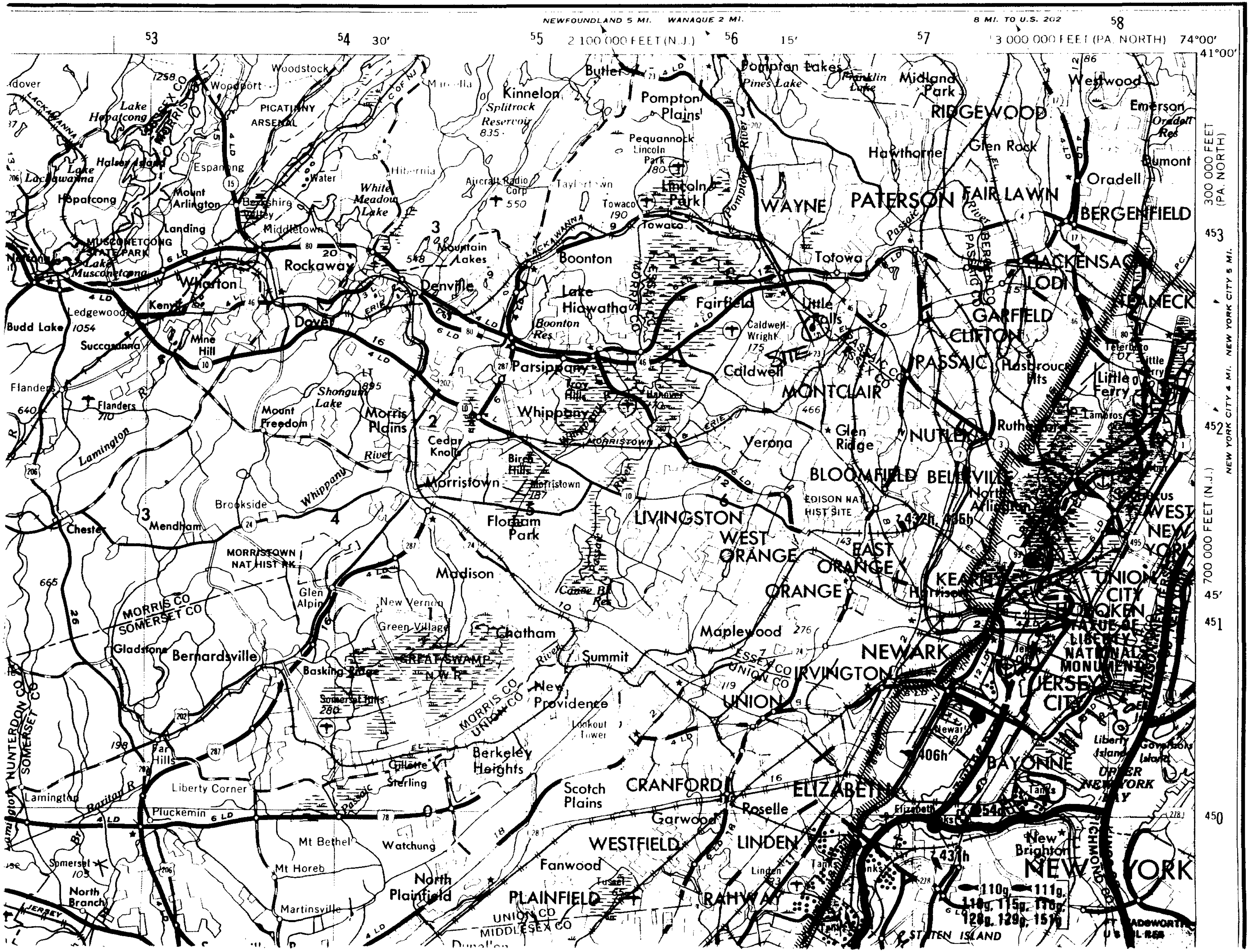
Localized concentration of species 800h

General habitat boundary for indicated species; may be superceded by special land use boundary 100d

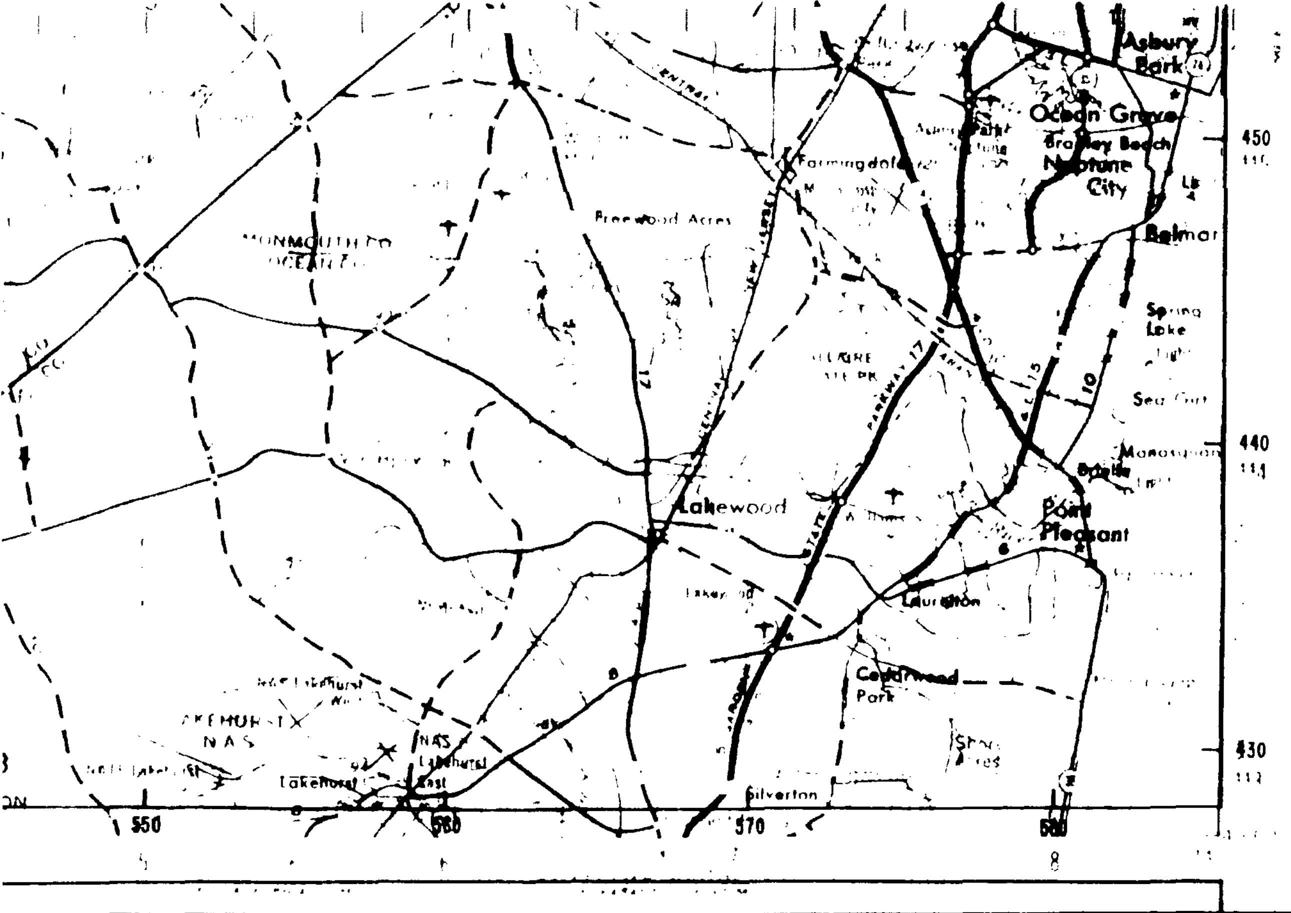
ATLANTIC COAST ECOLOGICAL INVENTORY

NEWARK, N. J.–N. Y.–PA.

1980


NEWFOUNDLAND 5 MI.
WANAQUE 2 MI.
8 MI. TO U.S. 202
2 100 000 FEET (N.J.)
3 000 000 FEET (PA. NORTH)
74°00′
41°00′
30′
15′
45′
300 000 FEET (PA. NORTH)
700 000 FEET (N.J.)
NEW YORK CITY 5 MI.
NEW YORK CITY 4 MI.
Woodstock
Butler
Pompton Lakes
Pines Lake
Franklin Lake
Midland Park
Westwood
Emerson
Oradell Res
Lake Hopatcong
Woodport
PICATINNY ARSENAL
Kinnelon
Splitrock Reservoir
Pompton Plains
RIDGEWOOD
Glen Rock
Dumont
Pequannock
Lincoln Park
Hawthorne
Oradell
Halsey Island
Lake Lackawanna
Espanong
Water
Hibernia
White Meadow Lake
Aircraft Radio Corp
Taylortown
Towaco
Lincoln Park
WAYNE
PATERSON
FAIR LAWN
BERGENFIELD
Hopatcong
Mount Arlington
Berkshire Valley
Middletown
Landing
MUSCONETCONG STATE PARK
Lake Musconetcong
Rockaway
Mountain Lakes
Boonton
Totowa
HACKENSACK
LODI
Wharton
Denville
Lake Hiawatha
Fairfield
Little Falls
TEANECK
Kenvil
Dover
Boonton Res
Caldwell-Wright
GARFIELD
Ledgewood
Budd Lake
Succasunna
Mine Hill
CLIFTON
Parsippany
Caldwell
PASSAIC
Hasbrouck Hts
Little Ferry
Flanders
Shongum Lake
Troy Hills
Hanover
MONTCLAIR
Teterboro
Mount Freedom
Morris Plains
Whippany
Glen Ridge
Rutherford
Lamington
Cedar Knolls
Verona
NUTLEY
Birch Hills
Morristown
River
Whippany
Morristown
BLOOMFIELD
BELLEVILLE
North Arlington
Brookside
Mendham
Chester
Florham Park
LIVINGSTON
EDISON NAT HIST SITE
WEST ORANGE
EAST ORANGE
WEST NEW YORK
MORRISTOWN NAT HIST PK
Madison
KEARNY
UNION CITY
ORANGE
Harrison
Glen Alpin
New Vernon
Canoe Brook Res
HOBOKEN
MORRIS CO
SOMERSET CO
Green Village
Chatham
Maplewood
STATUE OF LIBERTY NATIONAL MONUMENT
Gladstone
Bernardsville
GREAT SWAMP N W R
Summit
NEWARK
ESSEX CO
UNION CO
IRVINGTON
Basking Ridge
JERSEY CITY
Somerset Hills
New Providence
UNION
MORRIS CO
UNION CO
Lookout Tower
Newark
Liberty Island
Governors Island
HUNTERDON CO
SOMERSET CO
Far Hills
Berkeley Heights
BAYONNE
Gillette
UPPER NEW YORK BAY
Liberty Corner
Sterling
Scotch Plains
CRANFORD
ELIZABETH
Lamington
Raritan R
Passaic
Roselle
Pluckemin
Garwood
Elizabeth
New Brighton
Mt Bethel
Watchung
WESTFIELD
LINDEN
Somerset
NEW YORK
Mt Horeb
Fanwood
Linden
North Branch
North Plainfield
PLAINFIELD
RAHWAY
Martinsville
UNION CO
MIDDLESEX CO
STATEN ISLAND
LACKAWANNA
ERIE
MORRISTOWN
406h
431h
432h, 436h
110g, 111g, 115g, 116g, 128g, 129g, 151g

REFERENCE NO. 17



SIGNIFICANT HABITAT OVERLAY NO. 1 OF 1

NEW YORK STATE DEPARTMENT OF ENVIRONMENTAL CONSERVATION

DIVISION OF FISH AND WILDLIFE
BUREAU OF WILDLIFE

PREPARED FOR: SIGNIFICANT HABITAT UNIT
WILDLIFE RESOURCES CENTER
DELMAR, NEW YORK 12054
(518) 457-5782

PREPARED BY: HABITAT INVENTORY UNIT

QUAD: NEWARK, N.J.

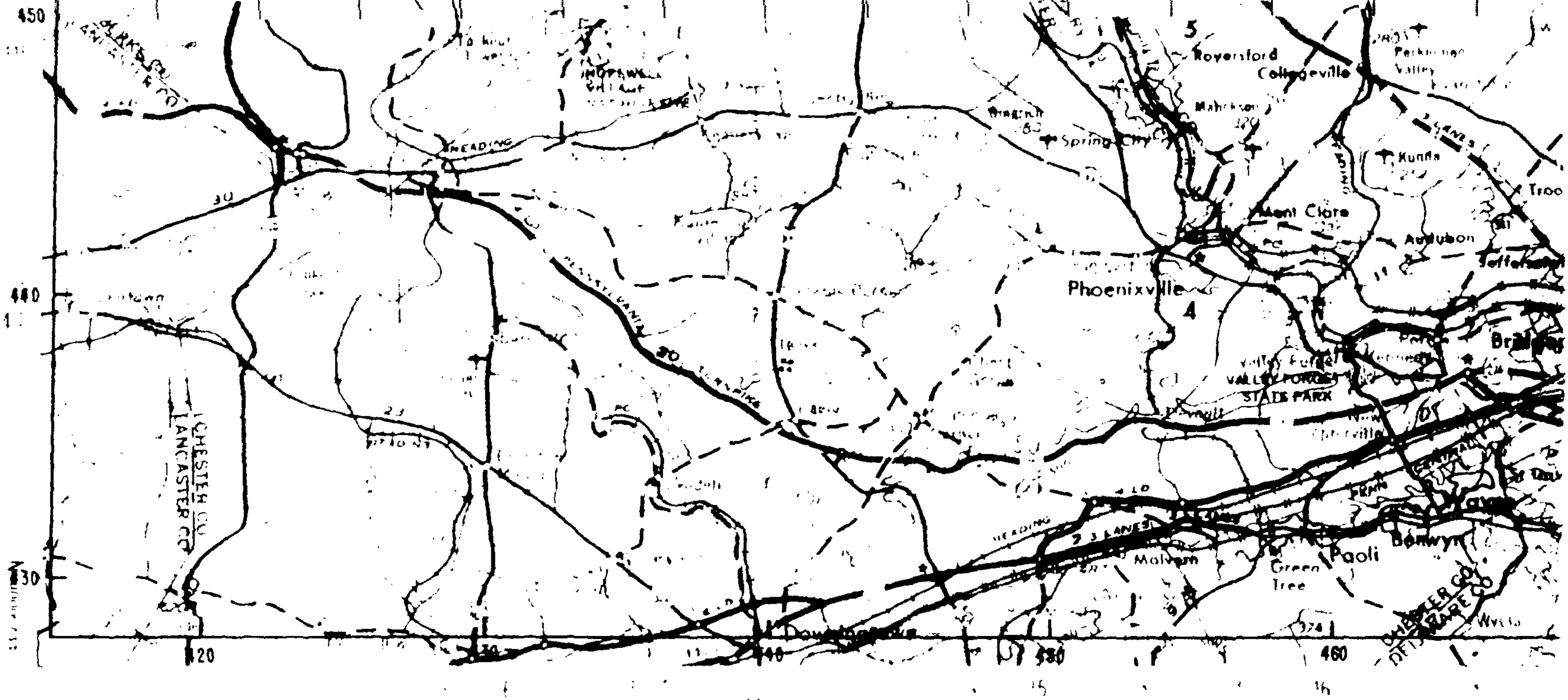
SCALE: 1:250,000

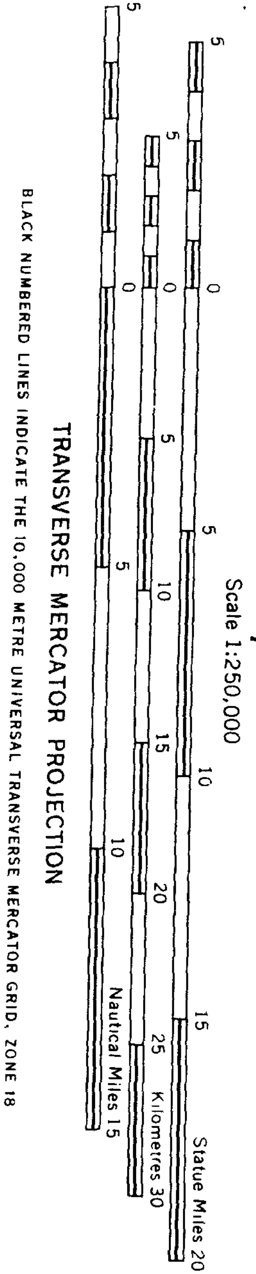
MARCH 1981

REVISED: 4/20/87 mg

STOCK NO. V501XNK1811 03

NEWARK 1234 6

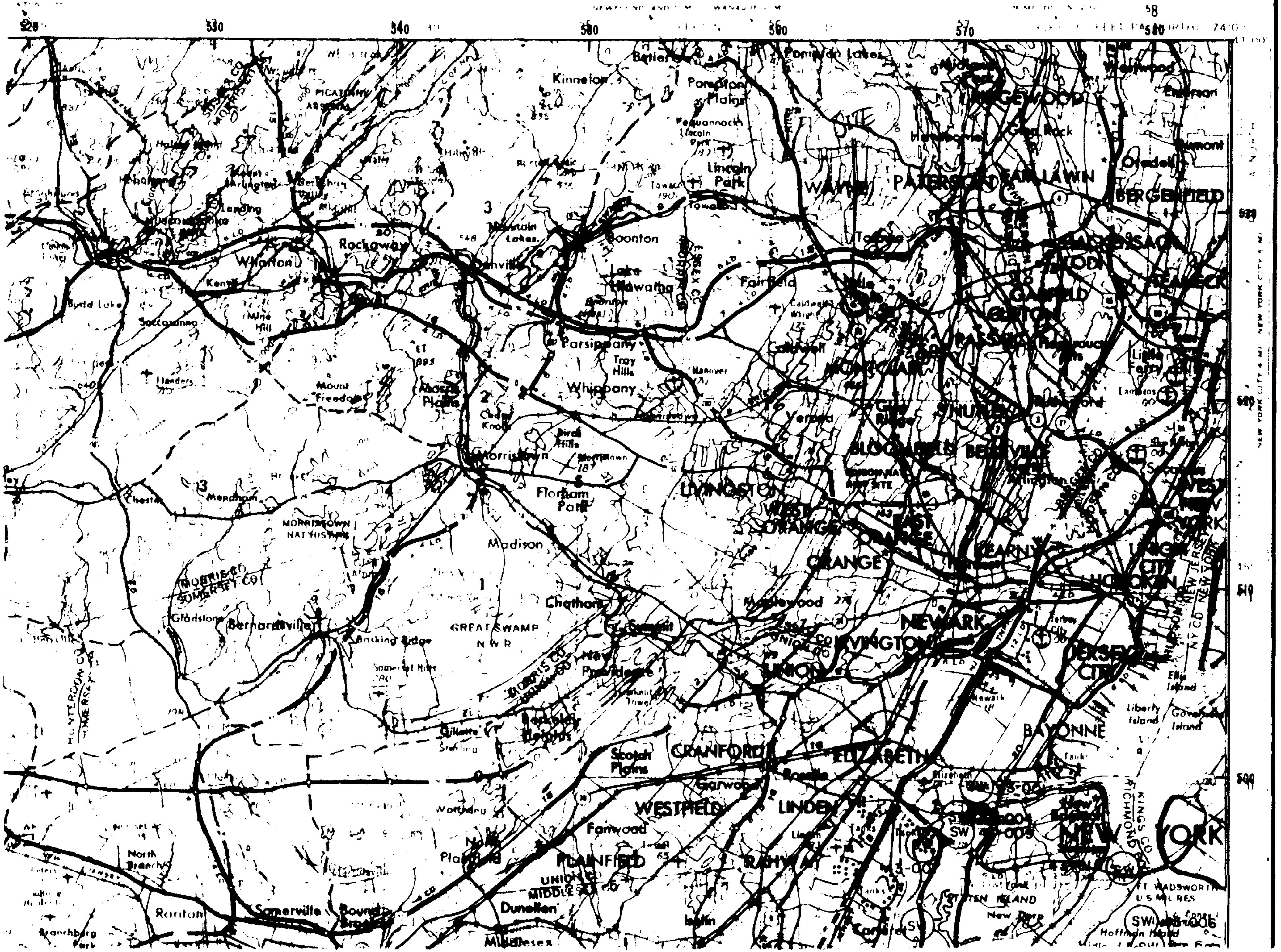




KEY

- SW — SIGNIFICANT FOR WILDLIFE
- SP — SIGNIFICANT FOR PLANTS
- SB — SIGNIFICANT FOR WILDLIFE AND PLANTS
- PW — POTENTIALLY SIGNIFICANT FOR WILDLIFE
- PP — POTENTIALLY SIGNIFICANT FOR PLANTS
- PB — POTENTIALLY SIGNIFICANT FOR WILDLIFE AND PLANTS
- OT — OTHER (e.g. UNIQUE GEOLOGICAL FORMATIONS)

BOSTON
RICHMOND
EVANSTON


520
530
540
550
560
570
580
Kinnelon
Pompton Lakes
Pompton Plains
Lincoln Park
Rockaway
Wharton
Boonton
Lake Hiawatha
Fairfield
Budd Lake
Succasunna
Parsippany
Troy Hills
Whippany
Caldwell
Montclair
Verona
Mount Freedom
Flanders
Morris Plains
Cedar Knolls
Morristown
Florham Park
Livingston
West Orange
East Orange
Orange
Chester
Mendham
Madison
Morristown Natl Hist Site
Chatham
Maplewood
Newark
Irvington
Union
Kearny
Hoboken
Union City
Jersey City
Bernardsville
Gladstone
Basking Ridge
Great Swamp N W R
Summit
New Providence
Berkeley Heights
Gillette
Stirling
Scotch Plains
Cranford
Elizabeth
Roselle
Garwood
Westfield
Linden
Fanwood
Plainfield
Rahway
Dunellen
Middlesex
Union Co
Middlesex Co
North Branch
Raritan
Somerville
Bound Brook
Branchburg
Bayonne
Ellis Island
Liberty Island
Governors Island
Staten Island
New York
Richmond Co
Kings Co
Bergenfield
Fair Lawn
Paterson
Wayne
Ridgewood
Garfield
Clifton
Passaic
Belleville
Bloomfield
Glen Ridge
Hackensack
Lodi
Westwood
Oradell
Dumont
Little Ferry
Lyndhurst
Rutherford
Nutley
West New York
Hunterdon Co
Somerset Co
Morris Co
New Jersey
New York
Ft Wadsworth U S Mil Res
New York City

REFERENCE NO. 18

STATE OF NEW JERSEY
DEPARTMENT OF ENVIRONMENTAL PROTECTION

DAVID J. BARDIN, COMMISSIONER

LEGEND

- AREA SERVED BY PRIVATE WATER SERVICE COMPANIES
- AREA SERVED BY REGIONALLY OWNED WATER SERVICE COMPANIES
- AREA SERVED BY MUNICIPALLY OWNED WATER SERVICE COMPANIES
- AREA NOT PRESENTLY SERVED BY WATER SERVICE
- PUBLIC SUPPLY WELLS
- SURFACE WATER INTAKE
- —W— MAJOR WATER MAINS
- TOWNSHIP BOUNDARIES
- COUNTY BOUNDARIES
- STATE BOUNDARIES

ALL MAP COORDINATES ARE FOR THE LOWER LEFT HAND CORNER.

Scale: 1:63,360

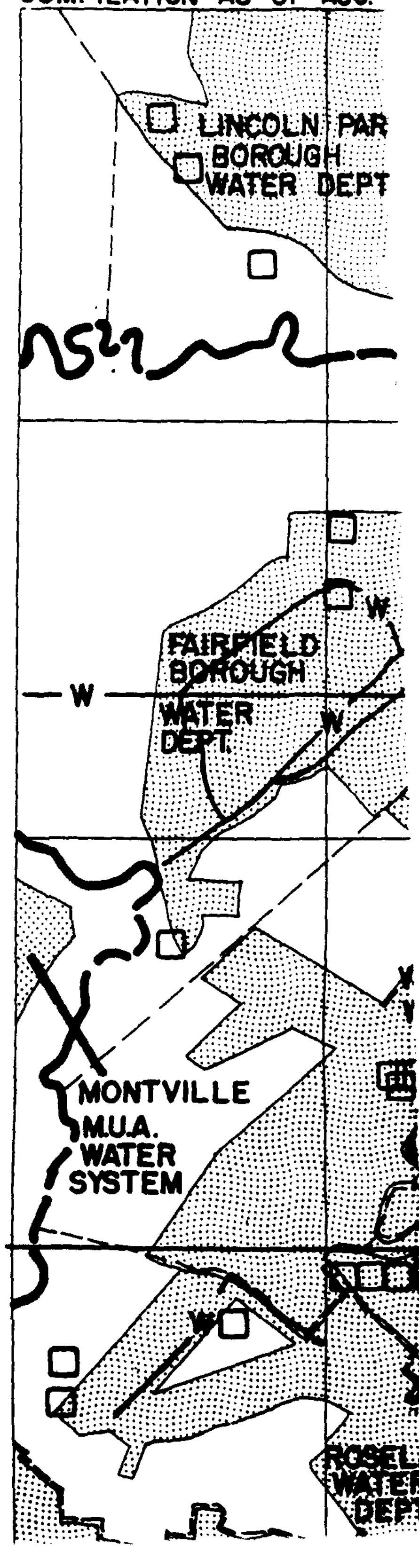
1 ½ 0 1 2 3 Kilometers

1 ¾ ½ ¼ 0 1 2 3 Miles

SUPERVISED BY GEORGE J. HALASI-KUN, TOPOGRAPHIC ENGINEER
DRAFTED BY JOHN F. OLSCHEWSKI

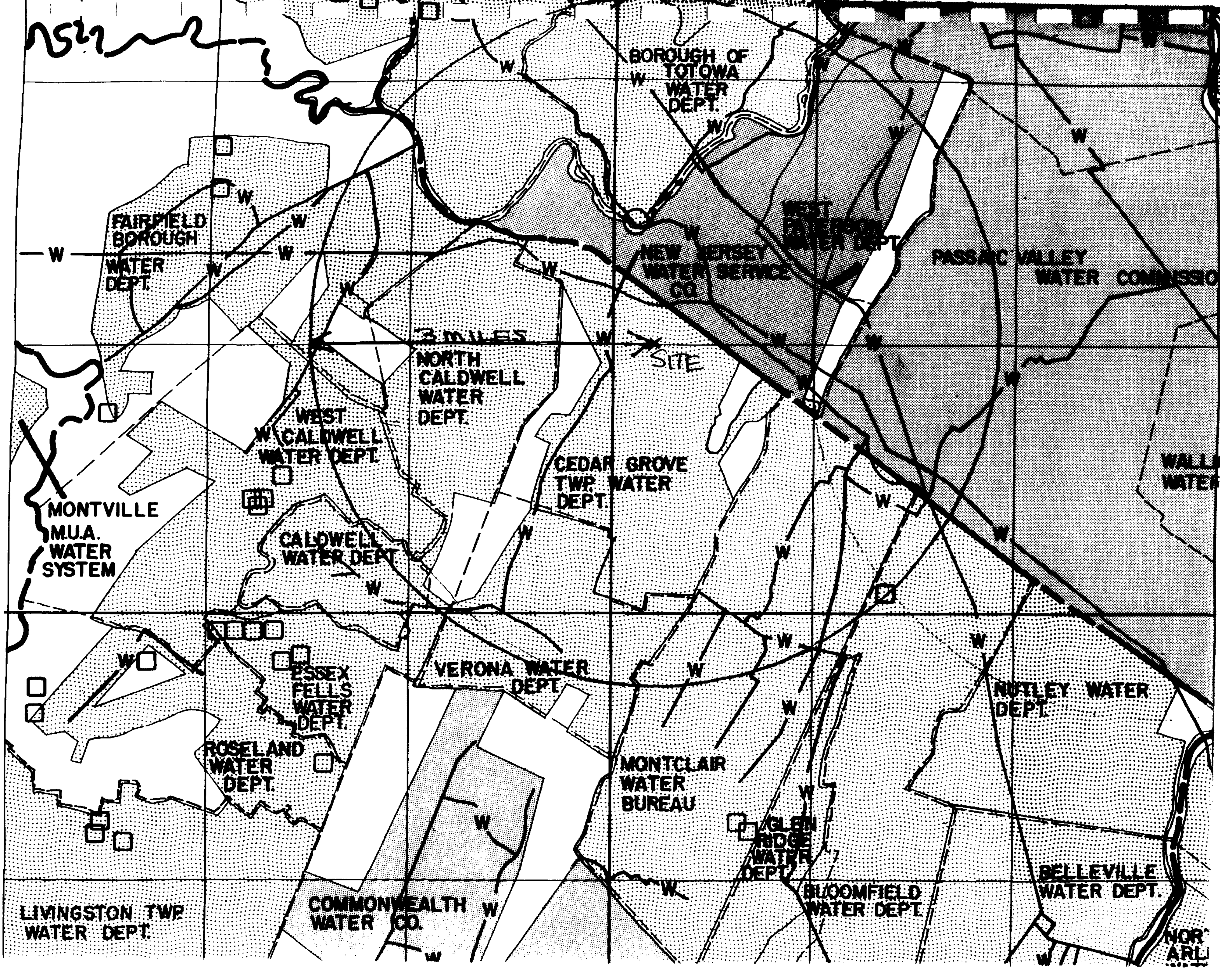
ANY CORRECTIONS OR ADDITIONAL INFORMATION WILL BE APPRECIATED

COMPILATION AS OF AUG.



CE

ICE


BOROUGH OF TOTOWA WATER DEPT.
FAIRFIELD BOROUGH WATER DEPT.
WEST PATERSON WATER DEPT.
NEW JERSEY WATER SERVICE CO.
PASSAIC VALLEY WATER COMMISSIO
3 MILES
SITE
NORTH CALDWELL WATER DEPT.
WEST CALDWELL WATER DEPT.
CEDAR GROVE TWP. WATER DEPT.
MONTVILLE M.U.A. WATER SYSTEM
CALDWELL WATER DEPT.
VERONA WATER DEPT.
ESSEX FELLS WATER DEPT.
ROSELAND WATER DEPT.
NUTLEY WATER DEPT.
MONTCLAIR WATER BUREAU
GLEN RIDGE WATER DEPT.
BELLEVILLE WATER DEPT.
BLOOMFIELD WATER DEPT.
LIVINGSTON TWP. WATER DEPT.
COMMONWEALTH WATER CO.

REFERENCE NO. 19

Surface Water Classifications

Surface Water Quality Standards

N.J.A.C. 7:9-4

May 1985

State of New Jersey, Department of Environmental Protection/Division of Water Resources

6. All waterways or waterbodies, or portions of waterways and waterbodies that are classified as PL only for those portions that are located within the boundaries of the Pinelands Area are classified as PL unless they are listed as FW1 waters in Index A. A tributary entering a PL stream is classified as PL only for those portions of the tributary that are within the Pinelands Area. Lakes are classified as PL only if they are located entirely within the Pinelands Area.

CLASSIFICATIONS:

FW1
FW2-TP -- FW2 Trout Production
FW2-TM -- FW2 Trout Maintenance
FW2-NT -- FW2 Non Trout
PL -- Pinelands Waters
SE1
SE2
SE3
SC
FW2-NT/SE1 (or similar designation) -- Indicates a waterway in which there may be a salt water/fresh water interface. The exact point of demarcation between the fresh and saline waters must be determined by salinity measurements and is that point where the salinity reaches 3.5 parts per thousand at mean high tide. The stream is classified as FW2-NT in the fresh portions (salinity less than or equal to 3.5 parts per thousand at mean high tide) and SE1 in the saline portions.

DESIGNATIONS:

(C1) -- Category 1 waters
[tp] -- Indicates trout production in waters which are classified as FW1; this is for information only and does not affect the water quality criteria for any stream
[tm] -- Indicates trout maintenance in waters which are classified as PL or FW1. For FW1 this is for information only and does not affect the water quality criteria for any stream.

(Stockholm) - Brook between Hamburg Turnpike and Williamsville-Stockholm Rd. to its confluence with Lake Stockholm Brook, north of Rt. 23	FW1 [tm]
LITTLE POND BROOK (Oakland) - Entire length	FW2-TP(C1)
LOANTAKA BROOK	
(Green Village) - Entire length, except segment described below	FW2-NT
(Great Swamp) - Brook and all tributaries within the boundaries of Great Swamp National Wildlife Refuge	FW2-NT(C1)
LUD-DAY BROOK	
(Camp Garfield) - Source to confluence with a tributary from Camp Garfield	FW1
MACOPIN RIVER	
(Newfoundland) - Source to Echo Lake dam	FW2-NT
(Newfoundland) - Echo Lake dam to Pequannock River	FW2-TM
MEADOW BROOK (Wanaque) - Skyline Lake to Wanaque River	FW2-NT
MILL BROOK	
(Randolph) - Source to Rt. 10 bridge	FW2-TP(C1)
(Randolph) - Rt. 10 bridge to Rockaway River	FW2-NT
MORSES CREEK - Entire length	FW2-NT/SE3
MOSSMAN'S BROOK - See CLINTON BROOK	
MT. TABOR BROOK (Morris Plains) - Entire length	FW2-NT
NEWARK BAY (Newark) - North of an east-west line connecting Elizabethport with Bergen Pt., Bayonne up to the mouths of the Passaic and Hackensack Rivers	SE3
NOSENZO POND (Upper Macopin)	FW2-NT(C1)
OAK RIDGE RESERVOIR (Oak Ridge)	FW2-TM
OAK RIDGE RESERVOIR (Oak Ridge) - Northwestern tributary to Reservoir	FW1 [tm]
OVERPECK CREEK (Palisades Park) - Entire length	FW2-NT/SE2
* PECKMAN RIVER (Verona) - Entire length	FW2-NT
PACACK BROOK	
(Stockholm) - Source to Pequannock River, excluding Canistear Reservoir, except segments described separately below	FW2-NT
(Canistear) - Brook and tributaries upstream of Canistear Reservoir located entirely within the boundaries of the Newark Watershed	FW1
PASSAIC RIVER	
(Mendham) - Source to Rt. 202 bridge (Van Doren's Mill), except tributaries described separately below	FW2-TM
(Paterson) - Rt. 202 bridge to Dundee Lake dam	FW2-NT
(Little Falls) - Dundee Lake dam to confluence with Second River	FW2-NT/SE2
(Newark) - Confluence with Second River to mouth	SE3

Surface Water Quality Standards

SURFACE WATER QUALITY STANDARDS

N.J.A.C. 7:9–4.1 et seq.

May 1985

New Jersey Department of Environmental Protection/Division of Water Resources

once-through basis for the duration of the test, in accordance with N.J.A.C. 7:18.

"Fresh water(s)" means all nontidal and tidal waters generally having a salinity, due to natural sources, of less than or equal to 3.5 parts per thousand at mean high tide.

"FW" means the general surface water classification applied to fresh waters.

"FW1" means those fresh waters that originate in and are wholly within Federal or State parks, forests, fish and wildlife lands, and other special holdings, that are to be maintained in their natural state of quality (set aside for posterity) and not subjected to any man-made wastewater discharges, as designated in Index A incorporated into this subchapter.

"FW2" means the general surface water classification applied to those fresh waters that are not designated as FW1 or Pinelands Waters.

"Heat dissipation area" means a mixing zone, as may be designated by the Department, into which thermal effluents may be discharged for the purpose of mixing, dispersing, or dissipating such effluents without creating nuisances, hazardous conditions, or violating the provisions of this subchapter.

"Hypolimnion" means the lower region of a stratified waterbody that extends from the thermocline to the bottom of the waterbody, and is isolated from circulation with the upper waters, thereby receiving little or no oxygen from the atmosphere.

"Important species" means species that are commercially valuable (e.g., within the top ten species landed, by dollar value); recreationally valuable; threatened or endangered; critical to the organization and/or maintenance of the ecosystem; or other species necessary in the food web for the well-being of the species identified in this definition.

"Industrial water supply" means water used for processing or cooling.

"Intermittent stream" means a stream with a MA7CD10 flow of less than one-tenth (0.1) cubic foot per second.

"Lake, pond, or reservoir" means any impoundment, whether naturally occurring or created in whole or in part by the building of structures for the retention of surface water, excluding sedimentation control and stormwater retention/detention basins.

"LC50" means the median lethal concentration of a toxic substance, expressed as a statistical estimate of the concentration that kills 50 percent of the test organisms under characteristics, but are suitable for a wide variety of other fish species.

"NPDES" means National Pollutant Discharge Elimination System.

"NT" means nontrout waters.

"Nutrient" means a chemical element or compound, such as nitrogen or phosphorus, which is essential to and promotes the growth and development of organisms.

"Outstanding National Resource Waters" means high quality waters that constitute an outstanding national resource (for example, waters of National/State Parks and Wildlife Refuges and waters of exceptional recreational or ecological significance) as designated in Index G incorporated into this subchapter.

"Persistent" means relatively resistant to degradation, generally having a half life of over 96 hours.

"Pinelands waters" means all waters within the boundaries of the Pineland Area, except those waters designated as FW1 in this subchapter, as established in the Pinelands Protection Act N.J.S.A. 13:18A-1 et seq. and shown on Plate 1 of the "Comprehensive Management Plan" adopted by the New Jersey Pinelands Commission in November 1980.

"PL" means the general surface water classification applied to Pinelands Waters.

"Primary contact recreation" means recreational activities that involve significant ingestion risks and includes, but is not limited to, wading, swimming, diving, surfing, and water skiing.

"Public hearing" means a legislative type hearing before a representative or representatives of the Department providing the opportunity for public comment, but does not include cross-examination.

"River mile" means the distance, measured in statute miles, between two locations on a stream, with the first location designated as mile zero. Mile zero for the Delaware River is located at the intersection of the centerline of the navigation channel and a line between the Cape May Light, New Jersey, and the tip of Cape Henlopen, Delaware.

"Saline waters" means waters having salinities generally greater than 3.5 parts per thousand at mean high tide.

"SC" means the general surface water classification applied to coastal saline waters.

"SE" means the general surface water classification applied to saline waters of estuaries.

(c) In all FW2 waters the designated uses are:

1. Maintenance, migration and propagation of the natural and established biota;

2. Primary and secondary contact recreation;

3. Industrial and agricultural water supply;

4. Public potable water supply after such treatment as required by law or regulation; and

5. Any other reasonable uses.

(d) In all SE1 waters the designated uses are:

1. Shellfish harvesting in accordance with N.J.A.C. 7:12;

2. Maintenance, migration and propagation of the natural and established biota;

3. Primary and secondary contact recreation; and

4. Any other reasonable uses.

(e) In all SE2 waters the designated uses are:

1. Maintenance, migration and propagation of the natural and established biota;

2. Migration of diadromous fish;

3. Maintenance of wildlife;

4. Secondary contact recreation; and

5. Any other reasonable uses.

(f) In all SE3 waters the designated uses are:

1. Secondary contact recreation;

2. Maintenance and migration of fish populations;

3. Migration of diadromous fish;

4. Maintenance of wildlife; and

5. Any other reasonable uses.

(g) In all SC waters the designated uses are:

1. Shellfish harvesting in accordance with N.J.A.C. 7:12;

REFERENCE NO. 20

GSC-TR8645

GRAPHICAL EXPOSURE MODELING SYSTEM

(GEMS)

USER'S GUIDE

VOLUME 2. MODELING

Prepared for:

U.S. ENVIRONMENTAL PROTECTION AGENCY
OFFICE OF PESTICIDES AND TOXIC SUBSTANCES
EXPOSURE EVALUATION DIVISION
Task No. 3-2
Contract No. 68023970
Project Officer: Russell Kinerson
Task Manager: Loren Hall

Prepared by:

GENERAL SCIENCES CORPORATION
8401 Corporate Drive
Landover, Maryland 20785

Submitted: December 1, 1986

GEMS> I

SERVOMETER CORPORATION
LATITUDE 40:52:10 LONGITUDE 74:13:26 1980 POPULATION

KM	0.00-.400	.400-.810	.810-1.60	1.60-3.20	3.20-4.80	4.80-6.40	SECTOR TOTALS
S 1	0	1584	8436	27211	63174	105896	206301
RING TOTALS	0	1584	8436	27211	63174	105896	206301

GEMS> I

SERVOMETER CORPORATION
LATITUDE 40:52:10 LONGITUDE 74:13:26 1980 HOUSING

KM	0.00-.400	.400-.810	.810-1.60	1.60-3.20	3.20-4.80	4.80-6.40	SECTOR TOTALS
S 1	0	524	2971	8741	21514	38879	72629
RING TOTALS	0	524	2971	8741	21514	38879	72629

DISTANCE	POPULATION	HOUSES
0.25	133	35
0.5	1717	559
1	10,153	3530
2	37,364	12,271
3	100,538	33,785
4	206,434	72,664

HOUSE COUNT OFF TOPO MAP

REFERENCE NO. 21

Central file

Let's protect our earth

State of New Jersey
DEPARTMENT OF ENVIRONMENTAL PROTECTION
DIVISION OF WATER RESOURCES
CN 029
TRENTON, NEW JERSEY 08625

GEORGE G. McCANN, P.E.
DIRECTOR

DIRK C. HOFMAN, P.E.
DEPUTY DIRECTOR

Certified Mail
Return Receipt Requested

Peter Holowachuk, President
Servometer Corporation
501 Little Falls Road
Cedar Grove, NJ 07009

AUG 20 1987

Dear Mr. Holowachuk:

Re: Response to comments and issuance of Final New Jersey Pollutant Discharge Elimination System (NJPDES) Discharge to Ground Water (DGW) Major Modification of existing NJPDES Discharge to Surface Water (DSW) Permit NJ0027847.

The following represents the New Jersey Department of Environmental Protection's (Department) response to comments submitted to the Department during the public comment period for the Draft Permit.

The comments submitted by the Servometer Corporation consisted of a letter detailing the history of the closure of the hazardous waste underground storage tank that initiated the issuance of the DGW Major Modification referenced above. Specific comments from the letter, with the Department response, follow.

Comments:

"Servometer Corporation feels the subject draft modification and associated ground water monitoring requirements are unwarranted. This position is based upon results of the site investigation conducted in February 1987, and previous statements made by the Division of Waste Management regarding the necessity for ground water monitoring at the site."

"In March, 1986 the closure plan for the underground storage tank was submitted to DEP for review. Mr. Frank Coolick, Division of Waste Management, issued a comment letter dated April 23, 1986 which indicated closure of the underground tank would not necessarily exempt Servometer from ground water monitoring requirements. The letter also stated that the closure plan was submitted to the Division of Water Resources for review and that

'You will be notified by this bureau of the results of the Division of Water Resources review'."

"On March 26, over one month after the site investigation had been implemented, closure approval was given in a letter from Mr. Coolick. This letter indicated that Servometer would be subject to the ground water monitoring requirements of NJAC 7:14A-6. Based upon prior verbal approval of the site investigation, Servometer assumed that this reference to ground water monitoring was in the event soil contamination was identified."

"On April 28, Mr. Mejia informed Mr. Dale Skoff of Lancy Environmental Services that both he and Mr. Stephen Urbanik of the Division of Water Resources had reviewed the report and concurred with the recommendations."

Response: As was stated in the cover letter of the Draft Permit, the New Jersey Hazardous Waste Regulations, N.J.A.C. 7:26-1 *et seq.*, and the NJPDES Regulations are the basis for ground water monitoring at all underground hazardous waste storage tank sites, not preliminary discussions held between representatives of the Department. Section 7:14A-6.15 (i) 4. of the NJPDES Regulations specifically mentions closure/post-closure monitoring:

> "The owner or operator shall determine groundwater quality at each groundwater monitoring well at the compliance point as specified in the permit, but at least semi-annually during the active life of a regulated unit (including the closure period) and the post-closure care period."

Although the Department did not explicitly state that ground water monitoring would be required in previous correspondence, actions taken on closure are done 'at risk' until final closure approval is given in writing. The final closure plan approval states that "Servometer shall be subject to the ground water discharge permit requirements of N.J.A.C. 7:14A-6 for ground water monitoring." There is no statement that this condition is based on the results of the soil sampling and in fact the plan was approved "subject to the following conditions..." (including the ground water monitoring). Further, in a phone conversation on February 18, 1987 between Mr. Skoff and Mr. Urbanik, it was stated by Mr. Urbanik that a final decision on ground water monitoring would not be made until the final closure approval was issued. Although approval of closure based on soil sampling alone was discussed between the Division of Water Resources-Bureau of Ground Water Quality Management (BGWQM) and the Division of Waste Management-Bureau of Hazardous Waste Engineering (BHWE), these were discussions only. The result of these discussions was that ground water monitoring would be required expressly because it is a regulatory requirement. The Department does not issue verbal approvals of such work actions precisely to avoid such confusion over regulatory requirements.

Comments:

"The site investigation, which consisted of sampling and analyses of eight soil borings in the vicinity of the underground tank and associated piping, showed that soil contamination did not exist in the vicinity of the tank. Based on these results, the 'potential' for discharge to ground water from the tank is for practical purposes non-existent."

"Servometer initiated this boring program after it was confident, based upon statements from the Division of Waste Management, that ground water monitoring would not be required unless soil contamination was identified from the boring program results."

"The final site investigation report was submitted to the Division of Waste Management on April 22, 1987. The report concluded that the tank had not leaked and that ground water monitoring was not necessary."

"Servometer recognizes that the cost of compliance should not be a consideration in enforcement of regulations. However, it should be noted that if Servometer is required to install ground water monitoring wells at this time, costs will be greatly increased over what the costs would have been by doing so as part of the February site investigation. For example, Servometer has drilled and backfilled borings which are in monitoring well locations required by the permit."

Response: The fact that analyses of soil samples indicates levels which are below acceptable limits for soil does not relieve a facility from ground water monitoring. Rather, a full soil/water scan must be completed. Complex soil/water interactions limit the value of soil testing as the only sampling mechanism utilized. Further, ground water standards are well below soil limits and the tank may have been located below the seasonally high ground water table. The soil borings did indicate moist and/or wet conditions.

It is difficult to coordinate a BHWE closure plan with the issuance of a NJPDES DGW Permit containing ground water monitoring requirements due to the constraints of public notice requirements. The Department recognizes the expense involved, but a monitoring system should have been in place since October of 1982 when the hazardous waste regulations went into effect and while the tank was in operation. Therefore, Servometer Corporation has been out of compliance with the hazardous waste regulations since October of 1982. This Permit Modification will bring the facility into compliance with these regulations.

The list of parameters to be sampled in the permit is less stringent than that required by the soil sampling and the NJPDES Regulations allow for relaxation of sampling parameters should ground water be within the Permit specified limits. In short, requirements are well below the minimum regulatory requirements for hazardous waste tank closures of this sort.

Enclosed is the previously Public Noticed Major Modification to your existing NJPDES/DSW Permit. This Modification is added to and made part of your Permit. This Major Modification is issued in accordance with the New Jersey Pollutant Discharge Elimination System Regulations, N.J.A.C. 7:14A-1 et seq. and you are required to comply with the terms and conditions of this Permit.

Within thirty (30) calendar days following your receipt of this Permit Modification, you may submit a request for an adjudicatory hearing to reconsider or contest the conditions of this Permit. Regulations regarding the format and requirements for requesting an adjudicatory hearing may be found in N.J.A.C. 7:14A-8.6 through 8.13. The request should be made to:

Administrator
Water Quality Management Element
Division of Water Resources
CN-029
Trenton, New Jersey 08625

If you have any questions on this action, please contact Stephen J. Urbanik of the Industrial Permits Section of the Bureau of Ground Water Quality Management at (609) 292-0424.

Sincerely yours,

Robert Berg, Chief
Bureau of Ground
Water Quality Management

WQM204

Enclosures

FACT SHEET
FOR THE NJPDES PERMIT TO DISCHARGE INTO THE GROUND WATERS OF THE STATE

Name and Address of Applicant:

Servometer Corporation
501 Little Falls Road
Cedar Grove, NJ 07009

Name and Address of Facility Where Discharge Occurs:

Servometer Corporation
501 Little Falls Road
Cedar Grove, NJ 07009

Receiving Water:

Ground Waters of the State. Glacial and alluvial overburden of the site is underlain by interbedded shale and sandstone of the Triassic Brunswick Formation and Triassic Watchung Basalt.

Description of Facility:

The Servometer Corporation manufactures metal bellows, couplings, contacts, and other metal components used in the manufacture of control valves and other related metal assemblies. Copper and nickel electroplating of aluminum parts is a major part of the operation (SIC Codes 3679, 3769, 3811, and 3823).

The following New Jersey hazardous wastes are generated in these operations:

D002--Caustic and acid waste.
F001--1,1,1 Trichloroethane solvent degreaser sludges.
F006--Plating wastewater treatment sludge.
X726--Waste machine oil.

Caustic waste will be stored in an above ground storage tank on closure of the existing 6,000 gallon capacity carbon steel underground caustic waste storage tank. This and other hazardous waste is transported off site for proper disposal. Non-hazardous waste treatment is regulated by the Discharge to Surface Water (DSW) portion of this permit.

Description of Discharge:

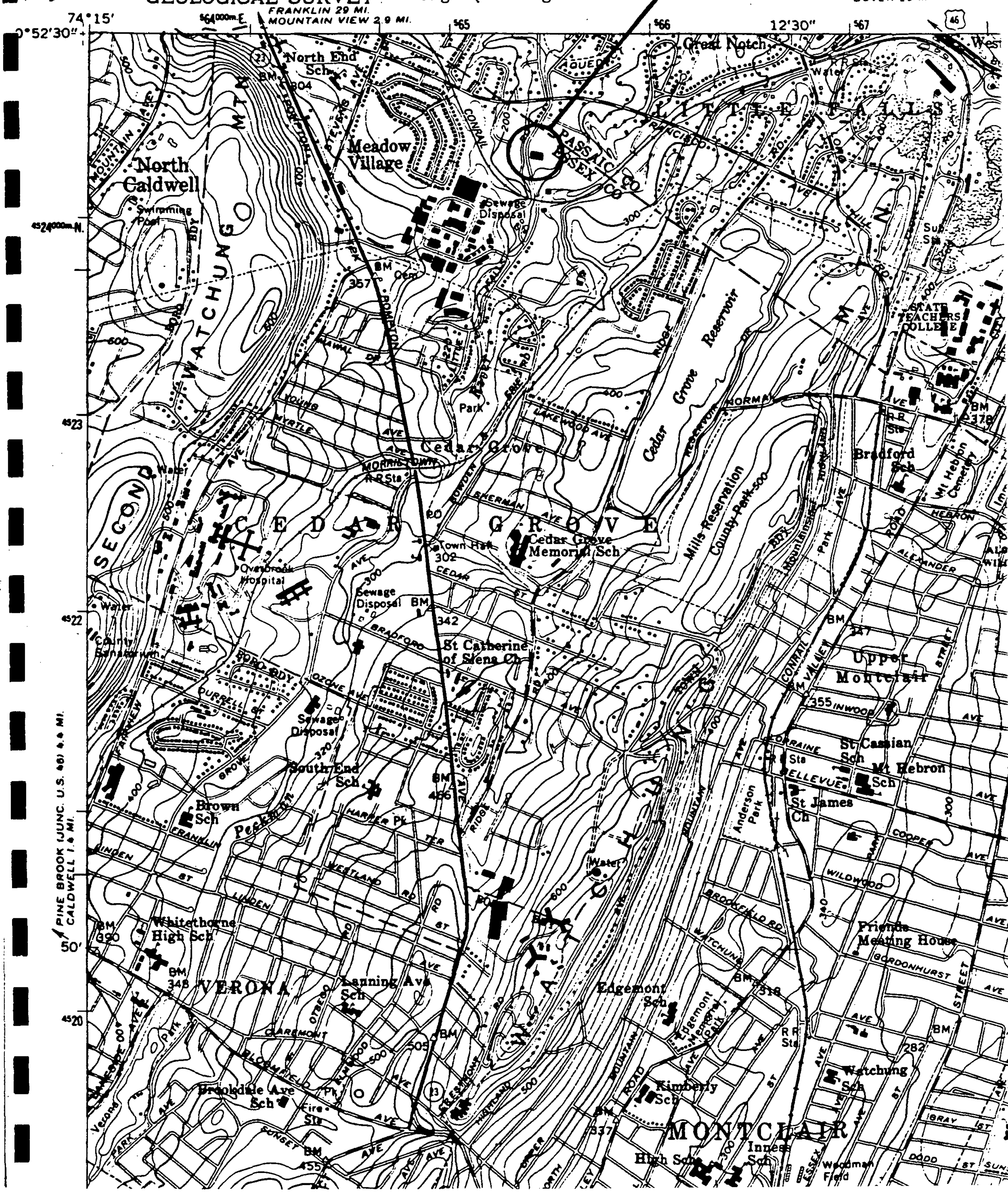
This permit will assess any possible impacts on ground water quality from a 6,000 gallon capacity carbon steel underground caustic waste storage tank utilized from the Fall of 1974 until the Spring of 1987 to store caustic waste (D002). This tank may be in contact with the seasonally high ground water table.

Permit Conditions:

According to the attached General and Specific Conditions.

UNITED STATES
DEPARTMENT OF THE INTERIOR
GEOLOGICAL SURVEY --Orange Quadrangle

Servometer Corporation



STATE OF NEW JERSEY
DEPARTMENT OF ENVIRONMENTAL PROTECTION
CN 402
Trenton, N.J. 08625

Let's protect our earth

PERMIT

The New Jersey Department of Environmental Protection grants this permit in accordance with your application, attachments accompanying same application, and applicable laws and regulations. This permit is also subject to the further conditions and stipulations enumerated in the supporting documents which are agreed to by the permittee upon acceptance of the permit.

Permit No.	Issuance Date	Effective Date	Expiration Date
NJ0027847	Oct. 9, 1984 Revised: Sept. 1, 1987	Dec. 1, 1984 Revised: Oct. 1, 1987	November 30, 1989

Name and Address of Applicant	Location of Activity/Facility	Name and Address of Owner
Servometer Corporation 501 Little Falls Road Cedar Grove, NJ 07009	501 Little Falls Road Cedar Grove, NJ 07009	Servometer Corporation 501 Little Falls Road Cedar Grove, NJ 07009

Issuing Division	Type of Permit	Statute(s)	Application No.
Water Resources	NJPDES-DSW/DGW Major Modification	N.J.S.A. 58:10A-1 et seq.	NJ0027847

This permit requires the Servometer Corporation to:

monitor for any past and/or potential discharges to ground water from the use of a 6,000 gallon capacity carbon steel underground caustic waste storage tank. Ground water quality will be monitored according to the general and specific conditions of the permit.

Existing discharge to surface water (DSW) permit requirements are not changed through this permit action and the permittee is not relieved from any of the requirements of the previously issued permit.

Approved by the Department of Environmental Protection
BY AUTHORITY OF:
GEORGE G. MCCANN, P.E.,
DIVISION OF WATER RESOURCES

ARNOLD SCHIFFMAN, ADMINISTRATOR
WATER QUALITY MANAGEMENT

DATE

The word permit means "approval, certification, registration, etc."

(GENERAL CONDITIONS ARE ON THE REVERSE SIDE.)

Form DEP-007 (8/83)

GROUND WATER MONITORING REQUIREMENTS AND LIMITATIONS

The permittee shall install and sample a total of four ground water monitoring wells according to the schedule below. All ground water elevations must be determined prior to pumping and sampling the wells. Sampling of the wells shall be performed according to the methodology specified in Section 6.12 of the NJPDES regulations and the Department's Field Procedures Manual for Water Data Acquisition. The permittee shall sample for all parameters listed below. Sampling shall be performed and reported during the months which are specified for that parameter.

PARAMETER	LIMITATION		SAMPLING MONTH	SAMPLE TYPE	REPORTING MONTH
Elevation of top of monitor well casing with cap removed (to be determined once but reported as indicated)			To Be Determined On Installation	N/A	APR JULY OCT JAN
Depth to Water Table from top of casing with cap removed prior to sampling			MAR JUNE SEP DEC	N/A	APR JULY OCT JAN
Depth to Water Table from original ground level prior to sampling			MAR JUNE SEP DEC	N/A	APR JULY OCT JAN
Aluminum	----	ppm	MAR JUNE SEP DEC	Grab	APR JULY OCT JAN
Chromium (Hex.) & Compounds	0.05	ppm	MAR JUNE SEP DEC	Grab	APR JULY OCT JAN
Chromium (Total)	----	ppm	MAR JUNE SEP DEC	Grab	APR JULY OCT JAN
Copper	1.0	ppm	MAR JUNE SEP DEC	Grab	APR JULY OCT JAN
Cyanide	0.2	ppm	MAR JUNE SEP DEC	Grab	APR JULY OCT JAN
Nickel	----	ppm	MAR JUNE SEP DEC	Grab	APR JULY OCT JAN
pH	5-9	SU	MAR JUNE SEP DEC	Grab	APR JULY OCT JAN
Total Volatile Organics by GC/MS	*1	ppb	JUNE	Grab	JULY
Zinc & Compounds	5	ppm	MAR JUNE SEP DEC	Grab	APR JULY OCT JAN

NOTES

*1 Volatile Organic Toxic Pollutants as defined in N.J.A.C. 7:14A-1.1 et seq., Appendix B can be reasonably divided into two classes; (A) carcinogens and (B) non-carcinogens.

Any chemical demonstrated to be carcinogenic to humans or experimental animals in a test peer-reviewed by either the National Toxicology Program of the U.S. Department of Health and Human Services or the International Agency for Research on Cancer will be considered to be a carcinogen (NJDEP Group A).

Chemicals which do not meet the criteria for placement in NJDEP Group A will be placed in NJDEP Group B. NJDEP Group B is further divided into Group B-1, chemicals for which no State or Federal maximum contaminant level (MCL) exists, and Group B-2, chemicals for which a State or Federal MCL exists. Where both a State and Federal MCL exists, the more stringent shall apply. If any applicable State or Federal standard, limitation or prohibition is more stringent than any limitation on the pollutant than the State or Federal MCL, the more stringent shall apply. Chemicals in NJDEP Group B-1 which do not currently meet the criteria for placement in NJDEP Group B-2 shall be transferred to NJDEP Group B-2 if they meet the criteria for placement in NJDEP Group B-2 in the future. Chemicals which do not currently meet the criteria for placement in NJDEP Group A will be placed in NJDEP Group B-1 or NJDEP Group B-2 and shall be transferred to NJDEP Group A if they meet the criteria for placement in NJDEP Group A in the future.

Currently, based upon scientific consensus, the following shall comprise NJDEP Group A and NJDEP Groups B-1 and B-2:

Group A	Group B
acrylonitrile	acrolein
benzene	bromoform
carbon tetrachloride	chlorobenzene
chloroform	chlorodibromomethane
1,2-dichloroethane	chloroethane
1,1-dichloroethylene	2-chloroethylvinyl ether
methylene chloride	dichlorobromomethane
1,1,2,2-tetrachloroethane	1,1-dichloroethane
tetrachloroethylene	1,2-dichloropropane
trichloroethylene	1,3-dichloropropylene
vinyl chloride	ethylbenzene
1,1,2-trichloroethane	methyl bromide
	methyl chloride
	toluene
	1,2-trans-dichloroethylene

Group B-2	MCL* (PPB)
1,1,1-trichloroethane	200

*EPA Proposed

Chemical compounds classified in NJDEP Group A are carcinogens and pose some level of risk even at low doses.

40 CFR Part 136-Method 624 shall be used to identify and monitor for the volatile organic compounds identified in Appendix B of the NJPDES Regulations. The GC/MS method 624 shall be utilized until the concentration of the constituents reach the corrective action criteria or the method detection limit, which ever is higher. If the method 624 method detection limit is higher than the corrective action criteria, 40 CFR Part 136 Methods 601, 602 and/or 603 shall then be utilized until the mandated corrective action criteria are achieved.

Corrective Action Criteria

A. The corrective action criteria for ground water of 5 parts per billion (ppb) shall apply to individual chemical compounds classified in NJDEP Group A. Hence, the concentration of any compound in NJDEP Group A shall not exceed 5 parts per billion in ground water.

B. The corrective action criteria for ground water of 50 parts per billion total Volatile Organic Toxic Pollutants shall apply to the sum of all compounds listed in NJDEP Group A and NJDEP Group B-1. Hence, the concentration of the sum of all compounds listed in NJDEP Groups A and B-1 shall not exceed 50 parts per billion in ground water.

C. The corrective action criteria for ground water for the compounds listed in NJDEP Group B-2 shall be equal to or less than their individual State or Federal MCL, the more stringent shall apply. Hence, the concentration of any compound in NJDEP Group B-2 shall not exceed it's MCL in ground water.

The permittee shall complete the forms required on the "Monitoring Report - Transmittal Sheet" (Form T-VWX-014) which is included as a part of this Permit. Failure to submit sampling data on the forms required on the "Monitoring Report - Transmittal Sheet" shall be considered by the Department to be a violation of the Permit sampling requirements and may place the Permittee subject to civil and administrative penalties pursuant to N.J.S.A. 58:10A-10. It shall be solely the Permittee's responsibility to maintain an adequate supply of the required report forms.

Satisfactory ground water monitoring wells are defined in Section 6.13 of the NJPDES regulations and shall be subject to Departmental approval. If ground water monitoring wells do not meet these standards, they must be replaced with new wells meeting Departmental standards.

A Ground Water Monitoring Well Certification (Forms A and B) shall be completed for each existing and proposed monitoring well. Information for each well must be shown on a separate form. For an existing well, if the information required on the Ground Water Monitoring Well Certification (Forms A and B) cannot be determined or the ground water monitoring well is not adequately constructed to meet the requirements of this Permit, the Department reserves the right to require a replacement well. Criteria to be used by the Department in judging the adequacy of a well will be related to the ability of the well to provide a representative ground water sample at any time of the year specified by the Permit. Any replacement well must be installed within a 10 foot radius of the existing well. Inadequate or damaged existing wells must be properly sealed pursuant to N.J.A.C. 58:4A-4.1. Instructions regarding sealing may be obtained by contacting the Water Allocation Office at (609) 292-0580.

Form T-VWX-014
5/83

NEW JERSEY DEPARTMENT OF ENVIRONMENTAL PROTECTION
DIVISION OF WATER RESOURCES

MONITORING REPORT – TRANSMITTAL SHEET

NJPDES NO. 0 0 0 2 7 8 4 7

REPORTING PERIOD MO. YR. THRU MO. YR.

PERMITTEE:
Name Servometer Corporation
Address 501 Little Falls Road
Cedar Grove, NJ 07009

FACILITY:
Name Servometer Corporation
Address 501 Little Falls Road
Cedar Grove, NJ 07009 (County) Essex

Telephone (201) 785-4630

FORMS ATTACHED *(Indicate Quantity of Each)*

SLUDGE REPORTS - SANITARY
☐ T-VWX-007 ☐ T-VWX-008 ☐ T-VWX-009

SLUDGE REPORTS - INDUSTRIAL
☐ T-VWX-010A ☐ T-VWX-010B

WASTEWATER REPORTS
☐ T-VWX-011 ☐ T-VWX-012 ☐ T-VWX-013

GROUNDWATER REPORTS
4 VWX-015(A,B) 4 VWX-016 ☐ VWX-017

NPDES DISCHARGE MONITORING REPORT
☐ EPA FORM 3320-1

OPERATING EXCEPTIONS

	YES	NO
DYE TESTING	☐	☐
TEMPORARY BYPASSING	☐	☐
DISINFECTION INTERRUPTION	☐	☐
MONITORING MALFUNCTIONS	☐	☐
UNITS OUT OF OPERATION	☐	☐
OTHER	☐	☐

(Detail any "Yes" on reverse side in appropriate space.)

NOTE: The "Hours Attended at Plant" on the reverse of this sheet must also be completed.

AUTHENTICATION - I certify under penalty of law that I have personally examined and am familiar with the information submitted in this document and all attachments and that, based on my inquiry of those individuals immediately responsible for obtaining the information, I believe the submitted information is true, accurate and complete. I am aware that there are significant penalties for submitting false information including the possibility of fine and imprisonment.

LICENSED OPERATOR

Name *(Printed)* ______

Grade & Registry No. ______

Signature ______

Date ______

PRINCIPAL EXECUTIVE OFFICER or DULY AUTHORIZED REPRESENTATIVE

Name *(Printed)* ______

Title *(Printed)* ______

Signature ______

Date ______

m VWX-015 A
4/83

NEW JERSE(PARTMENT OF ENVIRONMENTAL PROTECTI(
DIVISION OF WATER RESOURCES
WATER QUALITY MANAGEMENT ELEMENT

GROUND WATER ANALYSIS – MONITORING WELL REPORT

EASE TYPE OR PRINT WITH BALLPOINT PEN

CILITY NAME Servometer Corporation	SW ID NO.
LAB NAME	

	NJPDES NO.	WELL PERMIT NO.	SAMPLE DATE YR. | MO. | DAY	NJ LAB CERT. NO.	WQM USE
R	NJ 0 0 2 7 8 4 7	- -			
1	2 8	9 16	17 22	23 27	28

THE SCHEDULE INDICATED BELOW IS TO BE OBSERVED FROM ____ MO. YR. TO ____ MO. YR.

SUBMIT WITH SIGNED T-VWX-014

SAMPLING MONTHS

	Feb.	Mar.	Apr.	May	June	July	Aug.	Sept.	Oct.	Nov.	Dec.	ANALYSIS	UNITS	PARAMETER	VALUE	REMARKS
		X			X			X			X	Elevation of top of well casing with cap off (as specified in well completion report)	feet MSL: to nearest .01			
		X			X			X			X	Elevation of original ground level (as specified in well completion report)	feet MSL: to nearest .01			
		X			X			X			X	Depth to water table from top of casing prior to sampling with cap off	feet: to nearest .01	8 2 5 4 6		
		X			X			X			X	Depth to water table from original ground level prior to sampling	feet: to nearest .01	7 2 0 1 9		
		X			X			X			X	Aluminum, Dissolved	UG/L as Al	0 1 1 0 5		
												Barium, Dissolved	UG/L as Ba	0 1 0 0 5		
												Biochemical Oxygen Demand - 5 Day	MG/L	0 0 3 1 0		
												Cadmium, Dissolved	UG/L as Cd	0 1 0 2 5		
												Chloride, Dissolved	UG/L as Cl	8 2 2 9 5		
		X			X			X			X	Chromium, Dissolved	UG/L as Cr	0 1 0 3 0		
		X			X			X			X	Chromium, Dissolved, Hexavalent	UG/L as Cr	0 1 2 2 0		
												Chemical Oxygen Demand (COD), Dissolved	MG/L	0 0 3 4 1		
												Coliform Group	N/100 ML	7 4 0 5 6		
												Color	Pt - Co	0 0 0 8 0		
		X			X			X			X	Copper, Dissolved	UG/L as Cu	0 1 0 4 0		
		X			X			X			X	Cyanide, Total	MG/L as CN	0 0 7 2 0		
												Endrin, Total	UG/L	3 9 3 9 0		
												Fluoride, Dissolved	MG/L as F	0 0 9 5 0		
												Gross Alpha, Dissolved	Pc/L	0 1 5 0 3		
												Gross Beta, Dissolved	Pc/L	0 3 5 0 3		
												Hardness, Total as $CaCO_3$	MG/L	0 0 9 0 0		
												Iron, Dissolved	UG/L as Fe	0 1 0 4 6		
												Lead, Dissolved	UG/L as Pb	0 1 0 4 9		
		X			X			X			X	Nickel, Dissolved	UG/L as Ni	0 1 0 6 7		
		X			X			X			X	pH	Standard Units	0 0 4 0 0		
		X			X			X			X	Zinc, Dissolved	UG/L as Zn	0 1 0 9 0		

29	33 34	40 41
42	46 47	53 54
55	59 60	66 67
68	72 73	79 80

VALUE CODING RULES AND
REMARK CODES ON REVERSE

Form VWX-016
4/83

NEW JERSEY DEPARTMENT OF ENVIRONMENTAL PROTECTION
DIVISION OF WATER RESOURCES
WATER QUALITY MANAGEMENT ELEMENT

GROUND WATER ANALYSIS — VOLATILE ORGANICS REPORT

PLEASE TYPE OR PRINT WITH BALLPOINT PEN

FACILITY NAME	SW ID NO.
Servometer Corporation	
LAB NAME	

	NJPDES NO.	WELL PERMIT NO.	SAMPLE DATE YR. / MO. / DAY	NJ LAB CERT. NO.	WQM USE
T (1)	NJ 0027847 (2–8)	(9–16)	(17–22)	(23–27)	(28)

THE SCHEDULE INDICATED BELOW IS TO BE OBSERVED FROM ___ MO. YR. TO ___ MO. YR.

SUBMIT WITH SIGNED T-VWX-014

SAMPLING MONTHS

Jan.	Feb.	Mar.	Apr.	May	June	July	Aug.	Sept.	Oct.	Nov.	Dec.	ANALYSIS	UNITS	PARAMETER	VALUE	REMARKS
					X							Acrylonitrile	UG/L	34215		
												Benzene	UG/L	34030		
												Bromoform	UG/L	32104		
												Carbon Tetrachloride	UG/L	32102		
												Chlorobenzene	UG/L	34301		
												Chlorodibromoethane	UG/L	34306		
												Chloroform	UG/L	32106		
												1, 1 - Dichloroethane	UG/L	34496		
												1, 2 - Dichloroethane	UG/L	34531		
												1, 1 - Dichloroethylene	UG/L	34501		
												1, 2 - Dichloropropane	UG/L	34541		
												Ethylbenzene	UG/L	34371		
												Methylene Chloride	UG/L	34423		
												1, 1, 2, 2 - Tetrachloroethane	UG/L	34516		
												Tetrachloroethylene	UG/L	34475		
												Toluene	UG/L	34012		
												1, 1, 1 - Trichloroethane	UG/L	34506		
												1, 1, 2 - Trichloroethane	UG/L	34511		
												Trichloroethylene	UG/L	39180		
												Vinyl Chloride	UG/L	39175		
												Acrolein	UG/L	34210		
												Chloroethane	UG/L	34311		
												2 - Chloroethylvinyl Ether	UG/L	34576		
												Dichlorobromomethane	UG/L	32105		
												1, 3 - Dichloropropylene	UG/L	34699		
												Methyl Bromide	UG/L	34413		
												Methyl Chloride	UG/L	34418		
												1, 2 - trans - Dichloroethylene	UG/L	34546		
												1, 2 Dichlorobenzene	UG/L	34536		
												1, 3 Dichlorobenzene	UG/L	34566		
												1, 4 Dichlorobenzene	UG/L	34571		

29 33 34 40 41
42 46 47 53 54
55 59 60 66 67
68 72 73 79 80

VALUE CODING RULES AND
REMARK CODES ON REVERSE

Special Conditions for all NJPDES/DGW Permits

1. All ground water monitoring wells shall be installed by a licensed New Jersey well driller, pursuant to N.J.S.A. 58:4A-6. A valid New Jersey permit, issued pursuant to N.J.S.A. 58:4A-14, to drill a well must be obtained from the Water Allocation Office, (609) 292-0580 of the Division of Water Resources prior to installation of any ground water monitoring wells. The permittee shall provide the Industrial Permits Section of the Bureau of Ground Water Quality Management ((609) 292-0424) a minimum of two weeks notification prior to the installation of any ground water monitoring wells required within this permit.

2. All new wells shall be constructed according to the attached Department specifications. All new wells shall be logged using the U.S.D.A. Soil Textural Classification System. For sites where inadequate geological information is available to properly design the well specifications, a Department geologist will finalize the well specifications prior to drilling. Failure to obtain prior Departmental approval may result in disapproval of the wells as constructed and may require new wells to be installed.

3. A ground water monitoring well as required by this permit is a monitoring device under N.J.S.A. 58:10A-10 and as such the permittee is required to maintain the wells in proper working order at all times. The permittee is further required to take any and all reasonable steps necessary to limit public access by constructing fences, barricades, or any other structures or means necessary to restrict access to the ground water monitoring well(s). Said structures shall be maintained to restrict access.

4. The owner or operator shall inspect each ground water monitoring well on a weekly basis for structural integrity and/or damage. The permittee shall maintain a complete inspection record indicating dates of inspection, inspector's name, and conditions observed. These records shall be made available to the Department upon request. Failure to maintain or submit records upon request shall be a violation of the conditions of this permit.

5. If the monitoring wells are damaged or are otherwise rendered inadequate for their intended purpose, the Administrator, Water Quality Management Element, shall be notified within five days in writing indicating:

   (a) Which wells were damaged or rendered inadequate for their intended use;

(b) The cause and extent of damage or the reason for the inadequacy;

(c) If the sampling schedule as required in this permit will be violated or if the results of the sampling may reasonably become misleading;

(d) The date that the well will again be operational. Damaged wells must be replaced or repaired within thirty (30) days after the damage has occurred. The wells must be sampled within five (5) days after they have been installed. A replacement well must meet the construction requirements established by the Department. A valid New Jersey well permit is required prior to the installation of the replacement well;

(e) The next date that the well will be sampled.

Failure to follow these procedures is a violation of this permit and may subject the permittee to the provisions of N.J.S.A. 58:10A-10.

6. The permittee must obtain and analyze samples from the ground water monitoring system as required by this permit pursuant to the NJDEP <u>Field Procedures Manual for Water Data Acquisition</u> and as delineated in N.J.A.C. 7:14A-6.12. A chain of custody record for each sample shall be maintained at the facility and may be requested and/or examined by the Department. The permittee or his/her agent shall evacuate the ground water monitoring well(s) according to the procedures identified in Section 6.12 of the NJPDES regulations no more than four (4) hours prior to sample collection.

7. All samples shall be analyzed by a New Jersey Certified Laboratory. Sampling results shall be reported on forms provided by the Division of Water Resources and attached as Part III of this permit. Information not reported on the above specified forms shall not be deemed to fulfill the reporting requirements of this permit. It shall be the permittee's responsibility to maintain an adequate supply of forms to report round water monitoring data to the Department.

8. All permit required ground water monitoring wells, piezometers and/or lysimeters shall be installed within 30 days of the Effective Date of the permit.

9. Within 60 days of the Effective Date of the permit, the permittee shall identify to the Department by written notification all ground water monitoring wells or piezometers installed on the permittee's property during the period in which the permittee owned or had control of the property. The locations of these ground water monitoring wells and/or piezometers shall be shown on a plot plan drawn to a scale suitable to the Department.

10. The permittee shall submit to the Department "Ground Water Monitoring Well Certifications - Forms A and B" for each ground water monitoring well which is required to be sampled in the permit. The Ground Water Monitoring Well Certifications shall be submitted to:

    Stephen J. Urbanik
    NJDEP-Div. of Water Resources
    Bur. of Ground Water Quality Management
    CN-029
    Trenton, NJ 08625

    within 60 days of the Effective Date of the permit.

11. The permittee shall sample the ground water monitoring wells in the following order:

    1. MW-1
    2. MW-2
    3. MW-3
    4. MW-4

12. a. In the event that ground water monitoring requirements and limitations are exceeded, within three (3) days after detection of the exceedence the permittee shall notify the Department of the exceedence.

    b. The permittee shall submit to the Department a compliance monitoring program within thirty (30) days of written notification by the Department that the submission of the compliance monitoring program is required. The plan shall be in accordance with N.J.A.C. 7:14A-6.15 (j) and shall include an implementation schedule for further study to define the sources of contamination, the specific constituents of concern, and the vertical and horizontal extent of the plumes.

    c. Within thirty (30) days of written Departmental approval of the ground water monitoring program required above, the permittee shall begin the approved study.

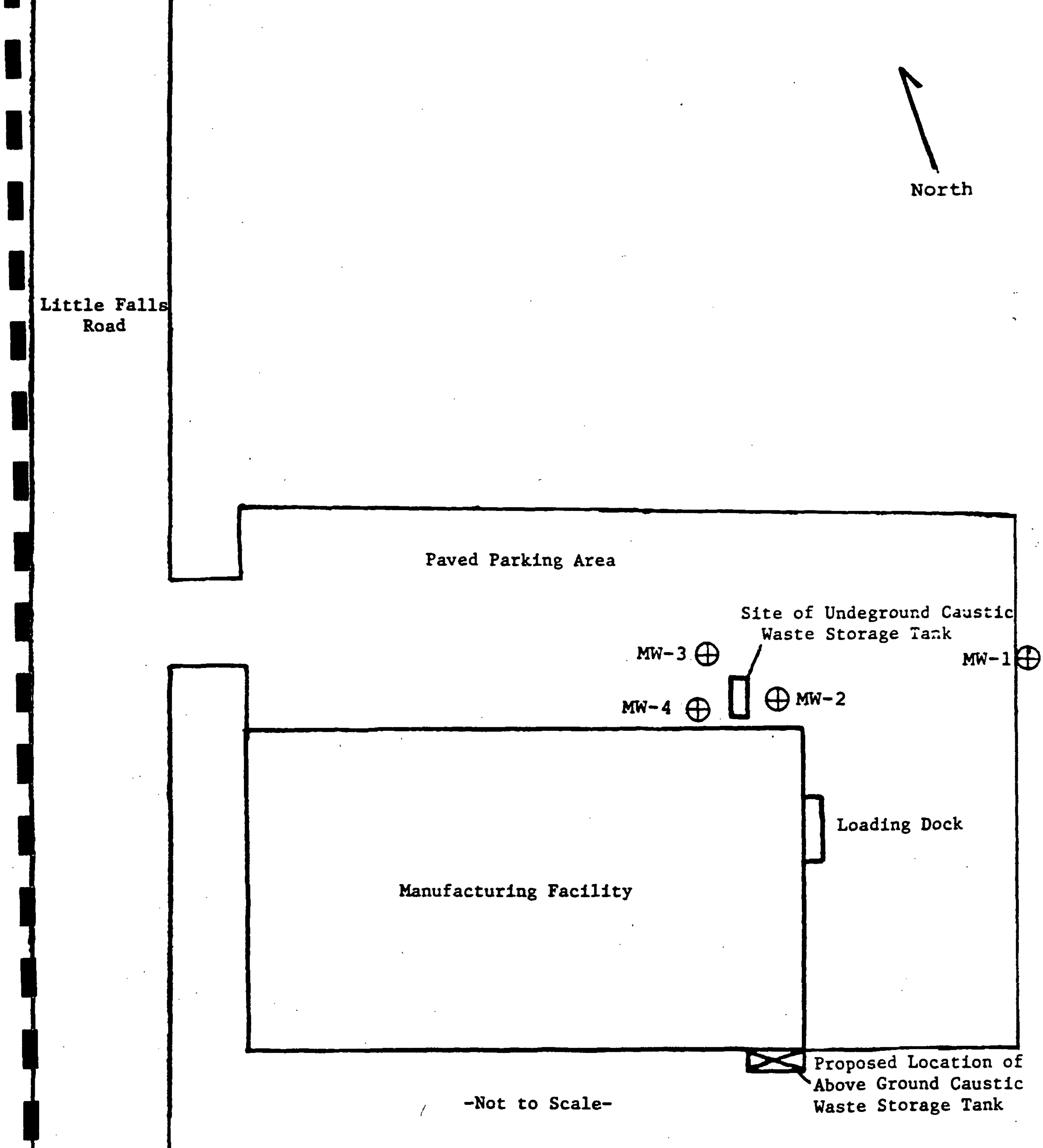
d. The approved ground water study shall be completed within 180 days of the Department's written approval of the program.

e. Within thirty (30) days of the completion of the ground water study identified above, the results of the study and recommendations concerning a corrective action program shall be submitted to the Department in writing. Pursuant to N.J.A.C. 7:14A-6.15 (j) 10, in the event that the permittee can demonstrate to the satisfaction of the Department that the permittee is not a responsible party for the permit exceedences investigated as a result of this Special Condition , the permittee shall not be responsible for the implementation of a corrective action plan as delineated herein.

Based upon receipt of the data generated by the approved plan, the Department shall make a determination regarding the need for corrective actions. If corrective actions are deemed necessary by the Department, implementation of such action will be required through the issuance of an Administrative Order, and Administrative Consent Order, a Major Modification to the NJPDES Permit, and/or other appropriate Departmental actions.

Servometer Corporation

Monitoring Well Locations



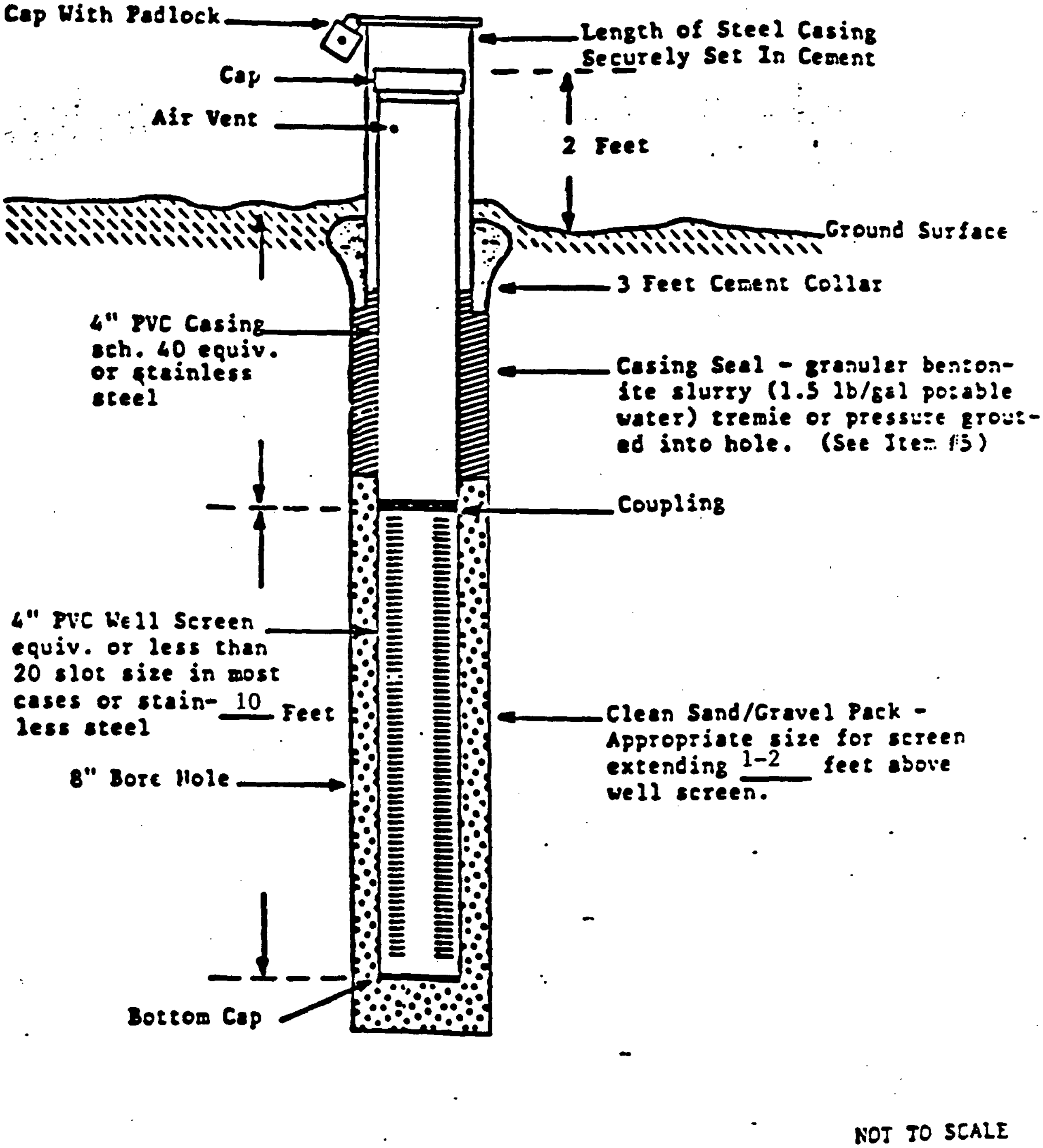
-diagram based on Lancy International, Inc. diagram submitted with August 1986 Closure Plan.

New Jersey Department of Environmental Protection
Unconsolidated Monitor Well Specifications*

Site Name: Servometer Corporation

Location: Cedar Grove, Essex County

Date: ________



REQUIREMENTS:

1. Notification to the NJDEP is required two (2) weeks prior to drilling. (609) 292-0424
2. State well permits are required for each monitor well constructed by the driller. Report "use of well" on well permit application. Permit number must be permanently affixed to each monitor well.

THIS FORM MUST BE C(LETED BY THE PERMITTEE O(IS/HER AGENT

GROUND WATER
MONITORING WELL CERTIFICATION - FORM A - AS-BUILT CERTIFICATION
(One form must be completed for each well)

Name of Permittee: Servometer Corporation
Name of Facility: Servometer Corporation
Location: 501 Little Falls Road
Cedar Grove, Essex County
NJPDES Permit No: NJ 0027847

ENGINEER'S CERTIFICATION

Well Permit Number (As assigned by NJDEP's Water Allocation Section (609-984-6831): This number must be permanently affixed to the well casing. __ __ __ __ __ __ __ __

Owner's Well Number (As shown on the application or plans): ______

Well Completion Date: ______

Distance from Top of Casing (cap off) to ground surface (one-hundredth of a foot); ______

Total Depth of Well (one-tenth of a foot): ______

Depth to Top of Screen From Top of Casing (one-tenth of a foot): ______

Screen Length (feet): ______

Screen or Slot Size: ______

Screen Material: ______

Casing Material: (PVC, Steel or Other-Specify): ______

Casing Diameter(Inches): ______

Static Water Level From Top of Casing at The Time of Certification (one-hundredth of a foot): ______

Yield (Gallons per Minute): ______

Length of time Well Pumped or Bailed: ______ Hours ______ Minutes

Lithologic Log: ATTACH ON BACK

AUTHENTICATION:

I certify under penalty of law that I have personally examined and am familiar with the information submitted in this document and all attachments and that, based on my inquiry of those individuals immediately responsible for obtaining the information, I believe the submitted information is true, accurate and complete. I am aware that there are significant penalties for submitted false information including the possibility of fine and imprisonment.

____
Professional Engineer's Signature

____
Professional Engineer's Name
(Please type or print)

SEAL

____
Professional Engineer's License #

THIS FORM MUST BE COMPLETED BY THE PERMITTEE OR HIS/HER AGENT

GROUND WATER MONITORING WELL CERTIFICATION - FORM B - LOCATION CERTIFICATION

Name of Permittee: Servometer Corporation
Name of Facility: Servometer Corporation
Location: 501 Little Falls Road
Cedar Grove, Essex County
NJPDES Number: NJ 0027847

LAND SURVEYOR'S CERTIFICATION

Well Permit Number (As assigned by NJDEP's Water Allocation Section, 609-984-6831): __ __-__ __ __ __ __-__
This number must be permanently affixed to the well casing.

Longitude (one-tenth of a second): West ____________
Latitude (one-tenth of a second): North ____________
Elevation of Top of Casing (cap off) (one-hundredth of a foot): ____________
Owners Well Number (As shown on the application or plans): ____________

AUTHENTICATION

I certify under penalty of law that I have personally examined and am familiar with the information submitted in this document and all attachments and that, based on my inquiry of those individuals immediately responsible for obtaining the information, I believe the submitted information is true, accurate and complete. I am aware that there are significant penalties for submitting false information including the possibility of fine and imprisonment.

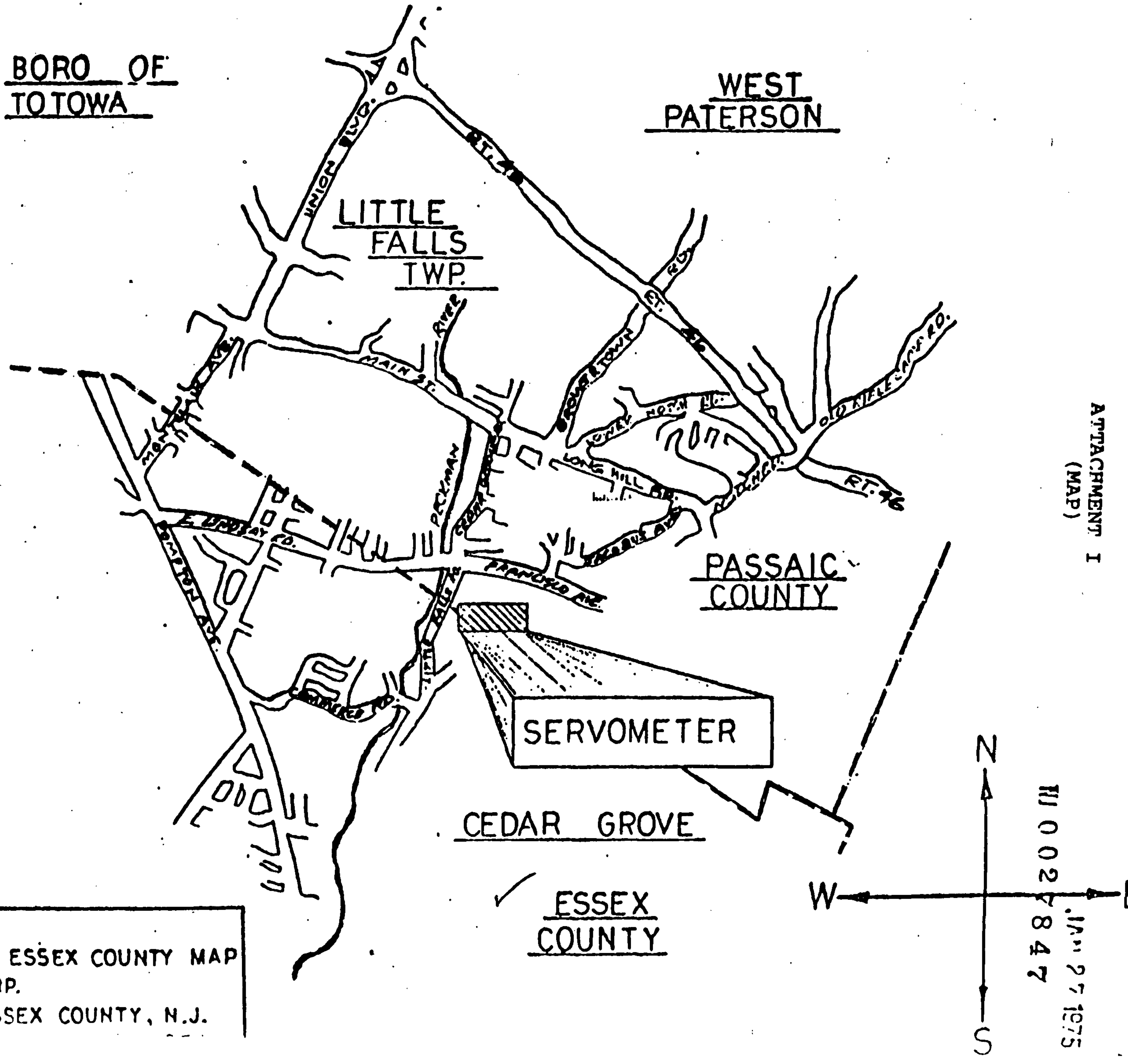
____
PROFESSIONAL LAND SURVEYOR'S SIGNATURE

____
PROFESSIONAL LAND SURVEYOR'S NAME
(Please print or type)

SEAL

____
PROFESSIONAL LAND SURVEYOR'S LICENSE #

The Department reserves the right in cases of violation of permit specified ground water limits or Ground Water Quality Standards (N.J.A.C. 7:9-6.1 et seq.) to require that wells be resurveyed to an accuracy of one-hundredth of a second latitude and longitude. This shall not be considered to require a major modification of the NJPDES permit.



"LOCATION MAP"
FROM HAGSTROM ESSEX COUNTY MAP
SERVOMETER CORP.
CEDAR GROVE, ESSEX COUNTY, N.J.

ATTACHMENT I
(MAP)

III 002 7847
JAN 27 1975

Page 3 of 7 pages

Please print or type in the unshaded areas only
(fill-in areas are spaced for elite type, i.e., 12 chara[illegible]/inch).

Form Approved OMB No. 158-R0175

FORM 1 GENERAL — EPA

U.S. ENVIRONMENTAL PROTECTION AGENCY

GENERAL INFORMATION

Consolidated Permits Program
(Read the "General Instructions" before starting.)

I. EPA I.D. NUMBER

F N J D 0 0 2 1 3 8 5 4 3

LABEL ITEMS

I. EPA I.D. NUMBER

III. FACILITY NAME

V. FACILITY MAILING ADDRESS

VI. FACILITY LOCATION

PERMIT RENEWAL

NJ0005 7947

PLEASE PLACE LABEL IN THIS SPACE

GENERAL INSTRUCTIONS

If a preprinted label has been provided, affix it in the designated space. Review the information carefully; if any of it is incorrect, cross through it and enter the correct data in the appropriate fill-in area below. Also, if any of the preprinted data is absent (the area to the left of the label space lists the information that should appear), please provide it in the proper fill-in area(s) below. If the label is complete and correct, you need not complete Items I, III, V, and VI (except VI-B which must be completed regardless). Complete all items if no label has been provided. Refer to the instructions for detailed item descriptions and for the legal authorizations under which this data is collected.

II. POLLUTANT CHARACTERISTICS

[illegible]

	YES	NO			YES	NO
[illegible]		X	[illegible]			X
[illegible]	X		[illegible]			X
[illegible]	X		[illegible]			X
[illegible] hydrocarbons. (FORM 4)		X	H. Do you or will you inject at this facility fluids for special processes such as mining of sulfur by the Frasch process, solution mining of minerals, in situ combustion of fossil fuel, or recovery of geothermal energy? (FORM 4)			X
[illegible]		X	J. Is this facility a proposed stationary source which is NOT one of the 28 industrial categories listed in the instructions and which will potentially emit 250 tons per year of any air pollutant regulated under the Clean Air Act and may affect or be located in an attainment area? (FORM 5)			X

III. NAME OF FACILITY

S E R V O M E T E R   C O R P O R A T I O N

IV. FACILITY CONTACT

A. NAME & TITLE (last, first, & title) — B. PHONE (area code & no.)

H O L O W A C H U K   M O R R I S   P R E S I D E N T   2 0 1   7 8 5   4 6 3 0

V. FACILITY MAILING ADDRESS

A. STREET OR P.O. BOX

3 5 0 1   L I T T L E   F A L L S   R O A D

B. CITY OR TOWN — C. STATE — D. ZIP CODE

4 C E D A R   G R O V E   N J   0 7 0 0 9

VI. FACILITY LOCATION

A. STREET, ROUTE NO. OR OTHER SPECIFIC IDENTIFIER

5 5 0 1   L I T T L E   F A L L S   R O A D

B. COUNTY NAME

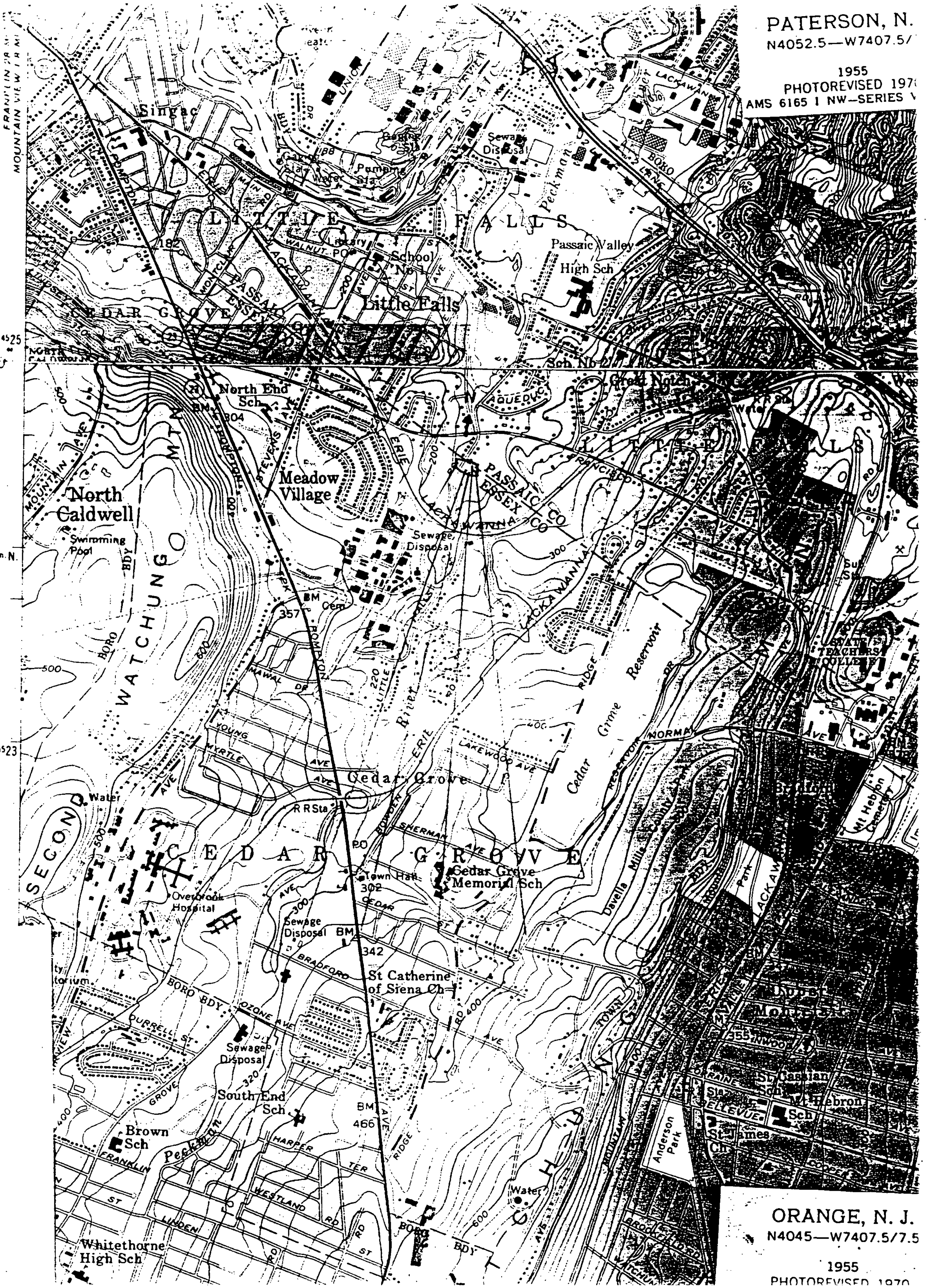
E S S E X

C. CITY OR TOWN — D. STATE — E. ZIP CODE — F. COUNTY CODE (if known)

6 C E D A R   G R O V E   N J   0 7 0 0 9

EPA Form 3510-1 (6-80)

CONTINUE ON REVERSE


PATERSON, N.
N4052.5—W7407.5/
1955
PHOTOREVISED 197
AMS 6165 I NW—SERIES V
Singac
LITTLE FALLS
Little Falls
Passaic Valley
High Sch
School
No 1
Library
CEDAR GROVE
Great Notch
North End
Sch
Meadow
Village
North
Caldwell
Swimming
Pool
WATCHUNG
Sewage
Disposal
PASSAIC CO
ESSEX CO
Cedar Grove Reservoir
Cedar Grove
R R Sta
CEDAR GROVE
Cedar Grove
Memorial Sch
Town Hall
Overbrook
Hospital
St Catherine
of Siena Ch
SECOND
South End
Sch
Brown
Sch
Whitethorne
High Sch
Anderson
Park
Water
STATE
TEACHERS
COLLEGE
Mt Hebron
Cemetery
St Cassian
Sch
Mt Hebron
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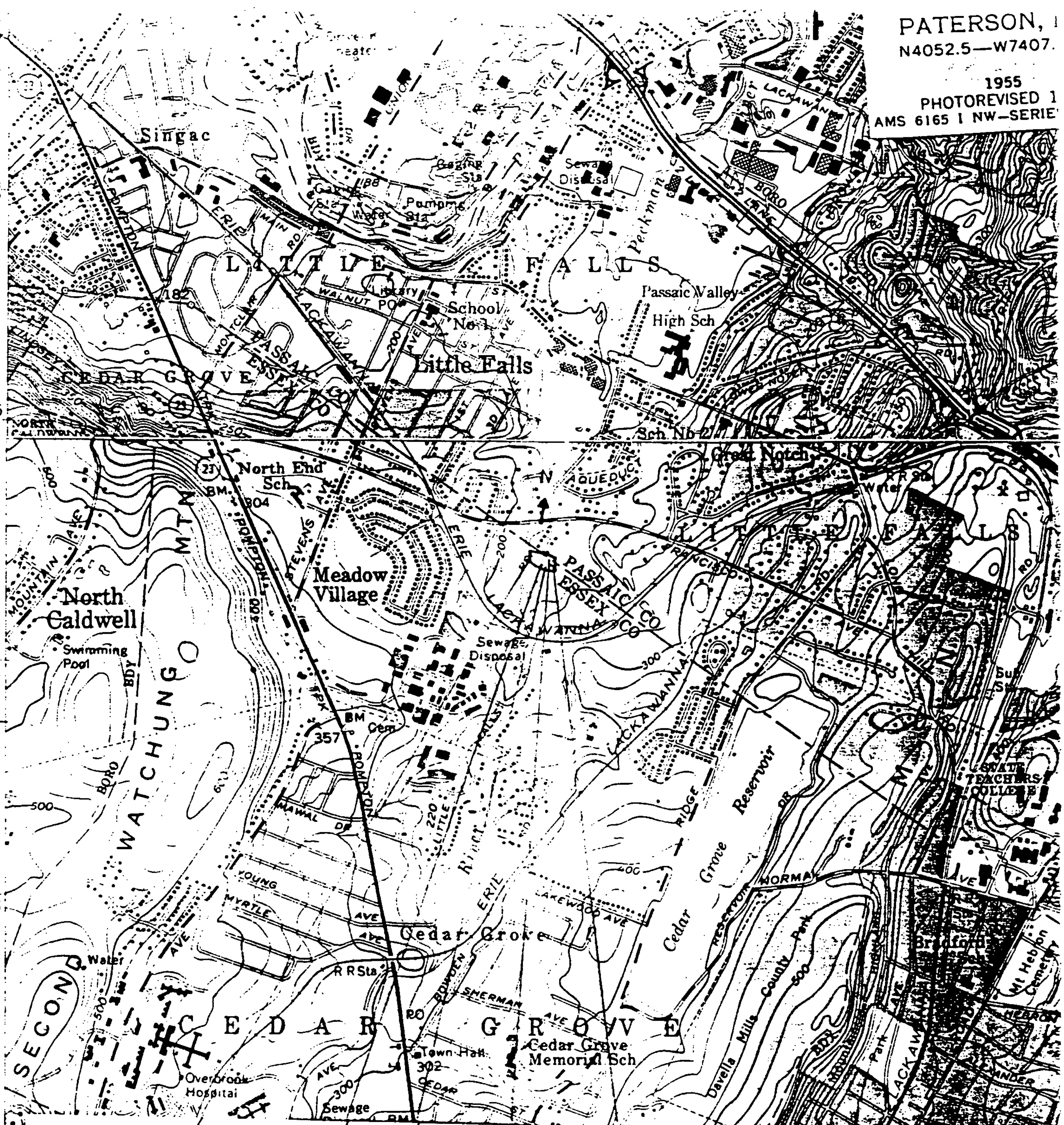
St James
Ch
ORANGE, N. J.
N4045—W7407.5/7.5
1955
PHOTOREVISED 1970



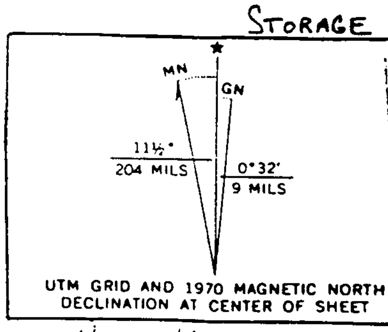
TREATED DISCHARGE INTO PECKMAN RIVER

5-55 GAL. DRUMS FOR OIL & TRICHLOR WASTE STORAGE AREA

1,500 GAL. PLATING SLUDGE WASTE STORAGE AREA

4-55 GAL. DRUMS FOR ACID STRIPPER WASTE

6,000 GAL. UNDERGROUND CAUSTIC WASTE STORAGE TANK

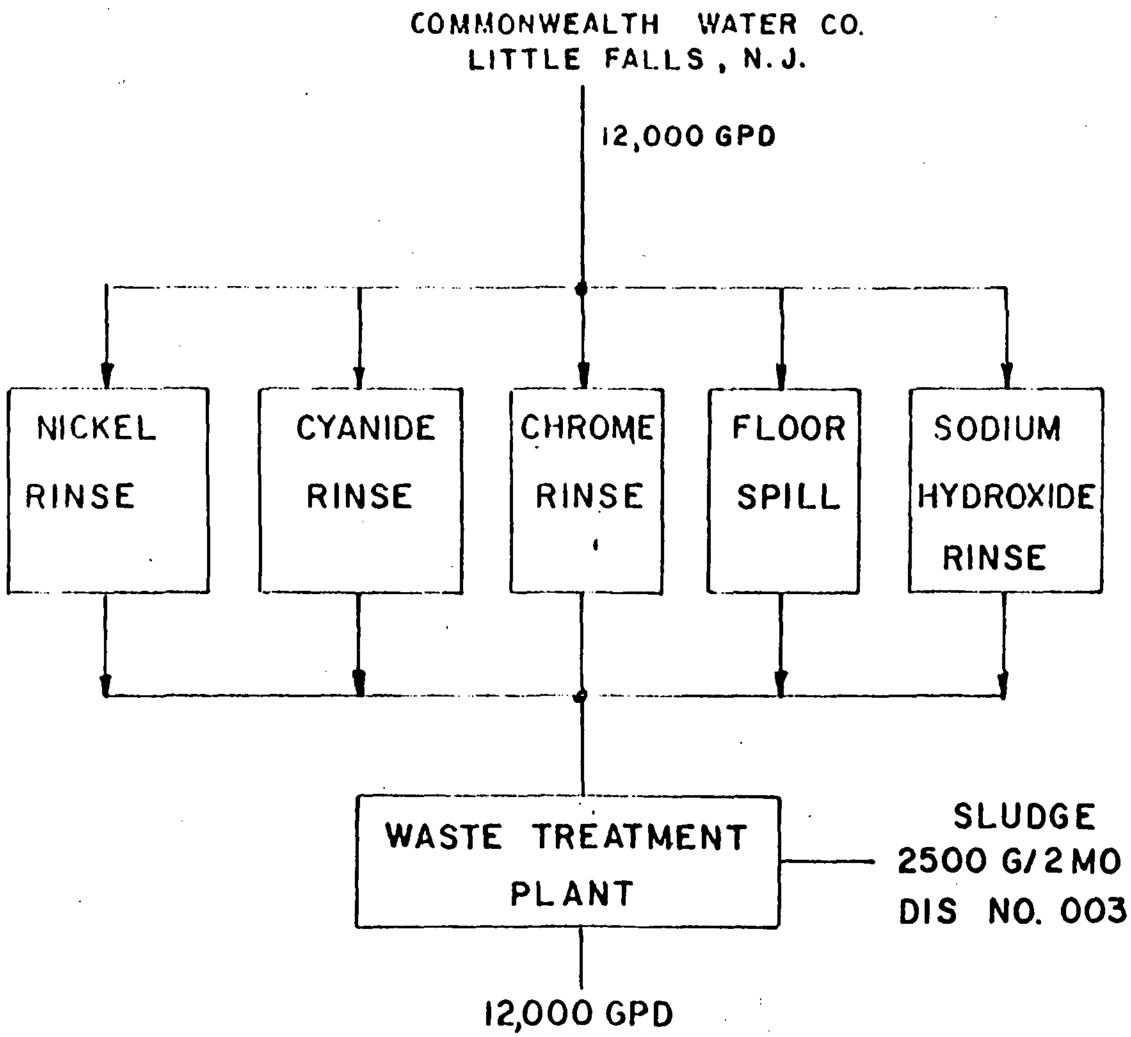


NOTE: PECKMAN RIVE[R] FLOWS NORTH

SCALE 1:24,000

1000 FEET 0

SERVOMETER (
CEDAR GROVE,



SCHEMATIC OF WATER FLOW
SERVOMETER CORPORATION
CEDAR GROVE
ESSEX COUNTY
NEW JERSEY

REFERENCE NO. 22

Please print or type with ELITE type (12 characters/inch) in the unshaded areas only.

Form Approved OMB No. 158-S79016
GSA No. 0246-EPA-OT

EPA
U.S. ENVIRONMENTAL PROTECTION AGENCY

NOTIFICATION OF HAZARDOUS WASTE ACTIVITY

INSTALLATION'S EPA I.D. NO.: NJD002138543

I. NAME OF INSTALLATION: SERVOMETER CORP

II. INSTALLATION MAILING ADDRESS: 501 LITTLE FALLS RD, CEDAR GROVE, NJ 07009

III. LOCATION OF INSTALLATION: 501 LITTLE FALLS RD, CEDAR GROVE, NJ 07009

INSTRUCTIONS: If you received a preprinte label, affix it in the space at left. If any of th information on the label is incorrect, draw a lir through it and supply the correct informatio in the appropriate section below. If the label complete and correct, leave Items I, II, and I. below blank. If you did not receive a preprinte label, complete all items. "Installation" means single site where hazardous waste is generate treated, stored and/or disposed of, or a tran. porter's principal place of business. Please refe to the INSTRUCTIONS FOR FILING NOTIF CATION before completing this form. Th information requested herein is required by la *(Section 3010 of the Resource Conservation an Recovery Act).*

DETACH

FOR OFFICIAL USE ONLY

COMMENTS

C

INSTALLATION'S EPA I.D. NUMBER	T/A	C	APPROVED	DATE RECEIVED (yr., mo., & day)
F NJD002138543	3	1		800814

I. NAME OF INSTALLATION

II. INSTALLATION MAILING ADDRESS

STREET OR P.O. BOX

3

CITY OR TOWN | ST. | ZIP CODE

4

III. LOCATION OF INSTALLATION

STREET OR ROUTE NUMBER

5

CITY OR TOWN | ST. | ZIP CODE

6

IV. INSTALLATION CONTACT

NAME AND TITLE (last, first, & job title)	PHONE NO. (area code & no.)
2 Holowachuk Morris President	201-785-4630

V. OWNERSHIP

A. NAME OF INSTALLATION'S LEGAL OWNER

8 Servometer Corporation

DETACH

B. TYPE OF OWNERSHIP (enter the appropriate letter into box)

F = FEDERAL
M = NON–FEDERAL

M

VI. TYPE OF HAZARDOUS WASTE ACTIVITY *(enter "X" in the appropriate box(es))*

[X] A. GENERATION
[ ] B. TRANSPORTATION *(complete item VII)*
[X] C. TREAT/STORE/DISPOSE
[ ] D. UNDERGROUND INJECTION

VII. MODE OF TRANSPORTATION *(transporters only – enter "X" in the appropriate box(es))*

[ ] A. AIR
[ ] B. RAIL
[ ] C. HIGHWAY
[ ] D. WATER
[ ] E. OTHER *(specify)*:

VIII. FIRST OR SUBSEQUENT NOTIFICATION

Mark "X" in the appropriate box to indicate whether this is your installation's first notification of hazardous waste activity or a subsequent notification. If this is not your first notification, enter your Installation's EPA I.D. Number in the space provided below.

[X] A. FIRST NOTIFICATION
[ ] B. SUBSEQUENT NOTIFICATION *(complete item C)*

C. INSTALLATION'S EPA I.D. NO.

IX. DESCRIPTION OF HAZARDOUS WASTES

Please go to the reverse of this form and provide the requested information.

I.D. – FOR OFFICIAL USE ONLY

S		T/A	C
W	NJD002138543	2	1

IX. DESCRIPTION OF HAZARDOUS WASTES *(continued from front)*

A. HAZARDOUS WASTES FROM NON–SPECIFIC SOURCES. Enter the four–digit number from 40 CFR Part 261.31 for each listed hazardous waste from non–specific sources your installation handles. Use additional sheets if necessary.

1	2	3	4	5	6
F001	F003	F006	F009		
7	**8**	**9**	**10**	**11**	**12**

B. HAZARDOUS WASTES FROM SPECIFIC SOURCES. Enter the four–digit number from 40 CFR Part 261.32 for each listed hazardous waste from specific industrial sources your installation handles. Use additional sheets if necessary.

13	14	15	16	17	18
19	**20**	**21**	**22**	**23**	**24**
25	**26**	**27**	**28**	**29**	**30**

C. COMMERCIAL CHEMICAL PRODUCT HAZARDOUS WASTES. Enter the four–digit number from 40 CFR Part 261.33 for each chemical substance your installation handles which may be a hazardous waste. Use additional sheets if necessary.

31	32	33	34	35	36
37	**38**	**39**	**40**	**41**	**42**
43	**44**	**45**	**46**	**47**	**48**

D. LISTED INFECTIOUS WASTES. Enter the four–digit number from 40 CFR Part 261.34 for each listed hazardous waste from hospitals, veterinary hospitals, medical and research laboratories your installation handles. Use additional sheets if necessary.

49	50	51	52	53	54

E. CHARACTERISTICS OF NON–LISTED HAZARDOUS WASTES. Mark "X" in the boxes corresponding to the characteristics of non–listed hazardous wastes your installation handles. *(See 40 CFR Parts 261.21 – 261.24.)*

☐ 1. IGNITABLE (D001)   ☒ 2. CORROSIVE (D002)   ☐ 3. REACTIVE (D003)   ☐ 4. TOXIC (D000)

X. CERTIFICATION

I certify under penalty of law that I have personally examined and am familiar with the information submitted in this and all attached documents, and that based on my inquiry of those individuals immediately responsible for obtaining the information, I believe that the submitted information is true, accurate, and complete. I am aware that there are significant penalties for submitting false information, including the possibility of fine and imprisonment.

SIGNATURE	NAME & OFFICIAL TITLE *(type or print)*	DATE SIGNED
Morris Holowachuk	Morris Holowachuk, President	8/12/80

REFERENCE NO. 23

Let's protect our earth

State of New Jersey

DEPARTMENT OF ENVIRONMENTAL PROTECTION

DIVISION OF HAZARDOUS WASTE MANAGEMENT

ENVIRONMENTAL PROTECTION AGENCY REGION II
88 DEC 16 PM 1:39
HAZARDOUS WASTE FACILITIES BRANCH

Michele M. Putnam
Deputy Director
Hazardous Waste Operations

John J. Trela, Ph.D., Director
401 East State St.
CN 028
Trenton, N.J. 08625-0028
(609)633-1408

Lance R. Miller
Deputy Director
Responsible Party Remedial Action

4/5/89 C119=3 C1103=$ C1105=6 C305=6
CMT 11:
C1
< 90 day

DEC 09 1988

Peter J. Holowachuk
President
Servometer Corporation
501 Little Falls Rd.
Cedar Grove, NJ 07009

Dear Mr. Holowachuk:

RE: Termination of TSD Status, Servometer Corporation, Cedar Grove, EPA ID No. NJD 002 138 543

The New Jersey Department of Environmental Protection (the Department) is in receipt of Servometer Corporation's certification of closure for the above referenced facility's underground hazardous waste storage tank. Previously, Servometer Corporation has been listed as a hazardous waste storage facility subject to permitting requirements because the facility filed a Part A permit application with the USEPA for storage of hazardous waste in a tank (S02). Upon review of the file, the Department has reached the following conclusion regarding present hazardous waste activities at the above referenced facility.

1. The facility accumulates hazardous waste (Caustic waste-D002) on-site in a 6,000 gallon aboveground fiberglass tank for 90 days or less.

2. The facility accumulates hazardous waste (waste acid and waste oils) on-site in containers for 90 days or less.

3. The 1,1,1-Trichloroethane still bottoms (F001) generated in the closed loop solvent vapor degreaser unit are pumped directly from the unit by the waste hauler.

4. Wastewater treatment sludge (F006) is pumped from an integral part of the wastewater treatment systems by the waste hauler. The effluent from the treatment system is discharged to surface water under NJPDES permit #NJ0027847.

If the aforementioned conclusion are incorrect, or incomplete, please contact the Department immediately.

DEC 0 9 1988

Assuming the aforementioned conclusion are correct, Servometer Corporation's facility identified by the following USEPA identification number:

NJD 002 138 543

is excluded from applicable hazardous waste treatment, storage, or disposal regulations under N.J.A.C. 7:26-1 et seq. based on the following:

A. Tank storage of hazardous waste generated on-site is in accordance with the following:

1. The 6,000 gallon aboveground fiberglass tank shall have sufficient shell thickness to ensure that the tank will not collapse or rupture. The facility shall perform daily inspections of the tank to detect ruptures, cracks, or any other deterioration and shall perform any repairs necessary to prevent a release of hazardous waste;

2. The controls to prevent overfilling shall be maintained in accordance with N.J.A.C. 7:26-10.5(c);

3. The tank storage area's secondary containment shall be maintained in accordance with N.J.A.C. 7:26-10.5(d);

4. The tank shall be maintained to ensure at least 99 percent of the volume of each tank can be readily emptied by direct pumping or drainage;

5. The tank shall be rendered empty, as defined at N.J.A.C. 7:26-1.4, every 90 days or less;

6. All waste removed from the tank shall be shipped off-site to an authorized facility or placed in an on-site, authorized facility, as defined at N.J.A.C. 7:26-1.4; and

7. While being accumulated on-site, the tank shall be clearly labeled or marked with the words "Hazardous Waste".

B. Container storage of hazardous waste generated on-site is in accordance with the following:

1. All such waste is, within 90 days or less, shipped off-site to an authorized facility or placed in an on-site authorized facility, as defined at N.J.A.C. 7:26-1.4.

2. The waste is placed in containers which meet the standards of N.J.A.C. 7:26-7.2 and are managed in accordance with N.J.A.C. 7:26-9.4(d).

3. The date upon which each period of accumulation begins is clearly marked and visible for inspection on each container. While being accumulated on-site, each container shall be clearly labeled or marked with the words "Hazardous Waste" and labeled in accordance with 49 CFR 172.304.

C. The generator complies with the requirements for owners and operators of N.J.A.C. 7:26-9.6 and 9.7 concerning preparedness and prevention, contingency plans and emergency procedures as well as N.J.A.C. 7:26-9.4(g) concerning personnel training.

Your company's hazardous waste facility above is no longer included in DEP's list of "existing facilities" (see N.J.A.C. 7:26-1.4 and 12.3) and therefore does not need to conform with the interim operating requirements of N.J.A.C. 7:26-1 et seq. for "existing facilities". It is the company's responsibility to operate within conditions listed above. To operate a hazardous waste facility without prior approval from the DEP is a violation of the Solid Waste Management Act N.J.S.A. 13:1E-1 et seq.

This written acknowledgement of the exclusion of the subject company from the hazardous waste facility requirements under N.J.A.C. 7:26-1 et seq. is based expressly on the review of the aforementioned correspondence. This letter makes no claim as to the extent and physical condition of the actual hazardous waste activities occurring at the site mentioned above.

The issuance of this delisting letter by the Department does not indicate, or imply, and should not be construed as a waiver of any requirements pursuant to the New Jersey Water Pollution Control Act, N.J.S.A. 58:10A-1 et seq. and regulations promulgated thereunder concerning the New Jersey Pollutant Discharge Elimination System, N.J.A.C. 7:14-1 et seq. If your facility is in any of the regulated categories identified in the above cited regulations, you are hereby directed to apply for any and all permits necessary within ninety (or 180 days - at the option of DWR) to the Bureau of Ground Water Discharge Permits, CN 029, Trenton, New Jersey, 08625. Applications may be obtained by calling (609) 292-0424.

Financial assurances required by N.J.A.C. 7:26-9.10 and N.J.A.C. 7:26-9.13 are obviated by the termination of treatment, storage, or disposal facility status. Enclosed is an original copy of Valley National Bank Irrevocable Standby Letter of Credit Number 1503. The Trust Agreement and the Letter of Credit which funds the Trust are hereby released by the Department. The Department is sending the Trustee a copy of this letter as the authorization to release the Trust Agreement and Letter or Credit.

If you have any questions concerning this matter, contact Michael Gerchman of my staff at (609) 292-9880.

Very truly yours,

Ernest J. Kuhlwein

Ernest J. Kuhlwein, Jr., Chief
Bureau of Hazardous Waste Engineering

EP62/lm
Attachment
c: Barry Tornick, USEPA
Yacoub E. Yacoub, BME
Ronald Bargiel, Valley National Bank

DOCUMENT: SERVOME2
FOLDER: LXMMCB

REFERENCE NO. 24

Let's protect our earth

State of New Jersey
DEPARTMENT OF ENVIRONMENTAL PROTECTION
DIVISION OF HAZARDOUS WASTE MANAGEMENT

John J. Trela, Ph.D., Acting Director
401 East State St.
CN 028
Trenton, N.J. 08625
609 - 633 - 1408

26 MAR 1987

Peter Holowachuk
Servometer Corporation
501 Little Falls Road
Cedar Grove, N.J. 07009

Dear Mr. Holwachuk:

RE: Closure Plan for Underground Storage Tank and Approval for Installation of New Tank at Servometer, EPA ID No. NJD 002 138 543, CP-86-11

The Bureau of Hazardous Waste Engineering has reviewed the revised closure plan for an underground tank, submitted by Servometer on August 20, 1986 and the 6,000 gal. tank replacement's design. The secondary containment system submitted on November 13 and December 18, 1986 has also been reviewed.

The Bureau finds the Closure Plan in compliance with the criteria set forth in N.J.A.C. 7:26-9.8. The plan is hereby approved subject to the following conditions:

1) The tank and soil sampling devices as well as the drill rig shall be decontaminated <u>before</u> initial use following the procedures outlined in Servometer's Closure Plan.

2) Field blanks of the rinsates from the decontaminated underground tank and the split spoon sampler before its initial use are required.

3) The Department requires appropriate analytical testing of the tank cleaning effluent to determine whether or not decontamination of the tank was properly performed. If the tank is still contaminated, further cleaning will be required or it may have to be excavated and disposed of as hazardous waste.

4) If the soil underneath and around the tank or the tank discharge piping is contaminated, a remediation plan shall be implemented. Please submit to the Bureau a remediation plan within 30 days of

the date when the results of the analysis are received, if decontamination is indicated.

5) The tank and the manhole shall not be filled and paved on, until the soil analysis results are received and confirmed that no contamination is present.

6) Servometer shall notify Mr. Steve Urbanik from the Division of Water Resources, two weeks in advance from the date when the soil sampling will be performed. Mr. Urbanik can be reached at (609) 292-0424. At the same time Servometer shall also notify George Mejia from the Bureau so arrangements can be made to have the Bureau of Environmental Measurements and Quality Assurance witness the sampling.

7) Pursuant to N.J.A.C. 7:26-9.8(j), Servometer shall complete closure activities within 180 days of the date of this approval.

8) Certification that the facility has closed in accordance with the specifications in the approved closure plan shall be provided by Servometer Corporation as well as an independent New Jersey registered professional engineer not later than 210 days after the date of their approval.

9) Please be aware that if analytical results prove that the tank was properly decontaminated and the soil is free of contamination, a notice in deed to property is not required per N.J.A.C. 7:26-9.9(a).

10) Servometer shall be subject to ground water discharge permit requirements of N.J.A.C. 7:14A-6 for ground water monitoring.

The Bureau has also found the designs of the new fiberglass tank and the secondary containment system in compliance with N.J.A.C. 7:26-10.5 and hereby grants approval to drawings SE-1. rev b, SE-2 rev b, SE-3 rev b (views 1 and 2), SE4, SE-5 and specifications ver. c of July, 1986 by Finishing Technology, and for drawing No. 12875-1 by Burt Process Equipment dated 3/29/86. The tank has the following thickness:

Bottom Head	5/16 in.
shell 0-4 ft (bottom-up)	5/16 in.
shell 4-10 ft	1/4 in.
shell 10-14 ft	3/16 in.

Since these are minimum requirements, these thicknesses shall be maintained for the tank's life.

The secondary containment shall have a capacity of 6000 gals. The bottom pad shall be reinforced concrete, 8 inches thick with a permeability rating not greater than 10^{-7} cm/sec. in accordance with N.J.A.C. 7:26-10.5(d).

The tank shall be managed per N.J.A.C. 7:26-9.3(b) and shall be emptied of 99% of its contents every ninety days or less. The overfilling prevention control shall be maintained in proper operating condition. The contents of

26 MAR 1987

tank shall ~~be~~ manifested off-site to an approved treatment, storage and disposal facility. In order to delist the facility in a timely manner, Servometer shall submit within thirty (30) days of the date of this approval, copies of the preparedness, prevention and contingency plans in accordance with N.J.A.C. 7:26-9.6 and 9.7, and personnel training program in accordance with N.J.A.C. 7:26-9.4(g). Also copies of the letters sent to the local Police and Fire Departments and to the local hospitals with the emergency plan must be provided. Be also reminded that two inspections by the fire Department are required every year.

The construction of the tank containment and installation of the tank is subject to an inspection and approval by the Bureau's engineers. Please, contact George Mejia at (609) 292-9880 upon completion of the construction to arrange for the inspection. After its approval, Servometer must empty the underground tank and start using the new tank. Servometer shall not store wastes in both, the old and the newly approved tank at any given time.

Should you have any questions, please contact George Mejia of my staff at (609) 292-9880.

Very truly yours,

Frank Coolick, Acting Assistant Director
Hazardous Waste Regulation Element

EP35/sg
c: Lori Amato, USEPA - Region II
Steve Urbanik, Ground Water

REFERENCE NO. 25

Form DWM-029
3/84

NEW JERSEY DEPARTMENT OF ENVIRONMENTAL PROTECTION
DIVISION OF WASTE MANAGEMENT

INSPECTION REPORT

REPORT PREPARED FOR:

- ☐ Generator
- ☐ Transporter
- ☑ HWM (TSD) Facility
- ☑ Closure

FACILITY INFORMATION

Name: Servometer Corporation

Address: 501 Little Falls Rd.
Cedar grove, N.J. 07009

Lot: 102 Block: 370

County: Essex

Phone: (201) ~~36~~ 785-0756

EPA ID#: NJD 00213 8543

Date of Inspection: 10/31/88

PARTICIPATING PERSONNEL

State or EPA Personnel: Chris Felicetti
Syed Uddin

Facility Personnel: Bertram James Barron

Report Prepared by Name: Chris Felicetti

Region: Metro

Telephone #: (201) 669-3960

Reviewed by: D. Sterling

Date of Review: 11-2-88

SUMMARY OF FINDINGS

FACILITY DESCRIPTION AND OPERATIONS

Servometer Corp manufactures electroform bellows for use in aircraft, medical equipment and other pressure demand situations.

Aluminum mandrils are machined to the proper shape at high tolerances, then platted with a non-reactive nickel. The parts are then "cooked" in a caustic bath which dissolves the aluminum, leaving the nickel shell intact.

Cutting and cooling oils are used during machining and 1,1,1-trichloroethane is used for degreasing.

Describe the activities that result in the generation of hazardous waste.

Spent caustic bath
lube and cutting oils from machining
1,1,1-trichloroethane from degreasing

Identify the hazardous waste located on site, and estimate the approximate quantities of each. (Identify Waste Codes)

3000 gal caustic solution - in tank - D002

How have these activities changed so as to justify delisting the company?

caustic
Waste used to be stored in an underground tank. Now caustic is stored in a 6000 gal above ground ~~ta~~ tank - labeled and emptied every 90 days or less.

Do company records support the delisting request?

✓ YES (Attach copies of records to the report)

____ NO (Explain)

Identify the hazardous waste located onsite, and estimate the approximate quantities of each. (Identify Waste Codes)

Conclusion. Should the generator's request for delisting be granted?

__✓__ YES

_____ NO (Explain)

CONFIDENTIAL – RECOMMENDATIONS

TO:

FROM: DATE:

SUBJECT:

REFERENCE NO. 26

07-04-03

J.S.
to be assigned as a part of RCRA Grant of 2nd QTR 89 (important).

Let's protect our earth

SEP 30

State of New Jersey
DEPARTMENT OF ENVIRONMENTAL PROTECTION
DIVISION OF HAZARDOUS WASTE MANAGEMENT

Michele M. Putnam
Deputy Director
Hazardous Waste Operations

John J. Trela, Ph.D., Director
401 East State St.
CN 028
Trenton, N.J. 08625-0028
(609)633-1408

Lance R. Miller
Deputy Director
Responsible Party Remedial Action

M E M O R A N D U M

SEP 29 1988

TO: Yacoub Yacoub, Chief
Bureau of Metro Enforcement

FROM: Ernest Kuhlwein, Jr., Chief EK
Bureau of Hazardous Waste Engineering

SUBJECT: Closure Inspection, Servometer Corporation, Cedar Grove
EPA ID No. NJD002138543

Attached for your review is a copy of the closure certification for the underground hazardous waste storage tank located at Servometer Corporation's Cedar Grove facility. The closure plan for this unit was approved by the DHWM on March 26, 1987, however modifications to the approved plan were necessary. A letter approving the modifications was issued on march 4, 1988. The storage tank has been decontaminated and excavated, and analysis of post-excavation soil samples indicates that no contamination of soil has occurred.

The facility currently has a New Jersey Pollutant Discharge Elimination System Permit (NJ0027847) which includes a major modification for discharge to groundwater from the underground hazardous waste storage tank. The facility also has approval from the BHWE to accumulate hazardous waste in an aboveground tank for less than 90 days.

The BHWE requests that your office perform a closure inspection of the facility in order to confirm closure of this storage tank. A copy of the completed inspection report should be sent to the BHWE so the facility may be delisted from the TSD status.

If you have any questions concerning this matter, contact Michael Gerchman at (609) 292-9880.

EP62:pjb
Attachment

07-04-13

CLOSURE OBSERVATION

UNDERGROUND STORAGE TANK

SERVOMETER CORPORATION

CEDAR GROVE, N.J.

SUBMITTED BY:

QUAZZA & ASSOCIATES, INC.
122 Sherman Avenue
Cedar Grove, NJ 07009
(201) 239-1258

August 5, 1988

BACKGROUND

Quazza & Associates, Inc. (QAI) was engaged by Lancy International, Inc. (LII) on behalf of Lancy Environmental Services Company (LESC) to review the Closure Plan for the removal of an underground hazardous waste storage tank for their client Servometer Corporation (SC). Additionally, QAI was to observe the removal of the storage tank in order to confirm that is was removed according to the Closure Plan approved by the New Jersey Department of Environmental Protection (NJDEP).

The following documents were reviewed and are included as Attachments:

1. Closure Plan dated March, 1986, Revised August 1986.
2. NJDEP letter to SC dated March 26, 1987 approving Closure Plan with conditions.
3. LESC letter to NJDEP dated October 2,1987 modifying Closure Plan.
4. LESC letter to NJDEP dated November 9, 1987 modifying Closure Plan.
5. LESC letter to NJDEP dated January 19, 1988 modifying Closure Plan.
6. NJDEP letter to SC dated March 4, 1988 approving LESC letter 1/19/88 with additional requirements.
7. LESC letter to NJDEP dated May 25, 1988 submitting 3/29/88 sampling results and request for approval of Closure.

Closure of Underground Storage Tank

Servometer Corporation, Cedar Grove, N.J.

EPA I.D. No. NJD002-138-543, CP-86-11

This report is made to certify that the closure of the underground storage tank at the Servometer Corporation in Cedar Grove, N.J. has been completed in accordance with the closure plan dated March 1986 (revised August 1986) and various modifications.

On Monday, December 7, 1987, the closure was initiated by Cute, Inc. of Midland Park, N.J. under the supervision of Mr. J. Kline of LESC of Zelionople, PA. This procedure was witnessed full time by the writer.

The residual wastes in the underground tank were removed by suction to a disposal truck operated by Freehold Cartage, Inc. (NJDEP License No. S2265). Reverse pumping was employed to remove the bulk of any sediments that might be present. The tank was then given an initial rinse via a high pressure spray nozzle using a boric acid solution. The rinse water was also removed by suction to the disposal tank truck.

The covering paving was then removed, and the underground tank was exposed by excavating the surrounding soil. The excavation was performed using the equipment supplied by Frank Jennings, Excavator, of Piscataway, N.J. under the direction of Cute, Inc. The removed paving and soil were placed on a plastic liner adjacent to the site. The underground tank was then removed and placed on a separate plastic liner.

At this point soil samples were taken at four points around the vessel location. No sample was taken from under the tank's position since a concrete support slab, unexpectedly, was discovered under the tank's former position. The soil samples were taken by Mr. J. Kline of LESC under the supervision and direction of Ms. H. Decerce of the NJDEP. Ms. Decerce, after consultation by phone with her superiors, stated the concrete slab need not be removed and that a soil sample from beneath the vessel's former position would not be required.

The excavated vessel was then cut open by torch to provide approximately a 3 foot by 3 foot opening in one head. One of the Cute, Inc. personnel, wearing full protective gear including face mask, then entered the tank for final cleanup.

Using cold, and then hot, boric acid solution sprayed through the high pressure nozzle, the tank was rinsed till not only visually clean of any and all sediments but till the final rinse was at a pH of 6. All rinse waters were removed by suction to the disposal tank truck.

Soil samples, and final tank rinse water sample, were then packed and shipped as manifested samples to the U.S. Testing Laboratories in Hoboken, N.J.

The excavated soil was covered with plastic sheeting and the excavated vessel was wrapped in plastic sheeting pending release from the NJDEP after review of soil and rinse water analyses. The excavated hole was to be covered with plywood and then plastic sheeting although this was not yet performed during the writer's stay.

Results of the tests by the U.S. Testing Laboratories indicated that elevated pH conditions existed in the northeast corner of the excavated area. All other samples and test criteria were acceptable. At this point, the excavated tank was cut-up and disposed of by Cute, Inc. (This activity was not witnessed).

On January 19, 1988 a plan for additional sampling and analysis for the northeast corner of the excavated area was submitted to the NJDEP by LESC. The plan was approved by the NJDEP, with modifications, on March 4, 1988.

On Tuesday, March 29, 1988, the additional sampling was performed jointly by employees of SC and Cute, Inc. This procedure was witnessed full time by the writer.

Approximately 15 cubic feet of soil were removed from the northeast corner of the excavation and placed in steel drums suitable labeled "Hazardous" pending approval from the NJDEP for disposal.

Three (3) soil samples were obtained from the northeast corner above the concrete pad in accordance with the plan as approved. An additional fourth sample was also taken in this area, but two feet below the existing pad. The soil sampling was again performed under the supervision and direction of Ms. Decerce of the NJDEP. All samples were shipped as manifested samples to the U.S. Testing Laboratories in Hoboken, N.J.

The excavation was then backfilled. The northeast corner was lined with plastic sheeting and filled with clean sand brought to the site by Cute, Inc. This was done to simplify re-excavation and additional sampling, if required, without contamination from the remainder of the backfill. The balance of the excavation was backfilled with the soil, and debris, originally removed.

Test results indicated that the required samples taken above the concrete pad met all the criteria of the closure plan. The fourth sample taken two feet below the pad indicated pH values only slightly above the established criteria.

On May 29, 1988, LESC requested that the NJDEP consider that the closure of this underground storage tank had been performed satisfactorily and permit final closure of the site.

Verbal approval by NJDEP has been received by LESC and the excavation site will be suitably paved and closed by SC at a later date.

Ralph A. Brummer

Ralph A. Brummer, P.E.
for Quazza & Associates, Inc.

PROFESSIONAL ENGINEER CERTIFICATION OF CLOSURE

I, Ralph A. Brummer, a registered
(Name)

professional engineer, hereby certify, to the best of my knowledge and belief, that I have made visual inspection(s) of the Servometer Corporation, 501 Little Falls Road, Cedar Grove, NJ 07009,

(Name and Address of Facility)

and closure of the Underground Waste Caustic Storage Tank has been performed in accordance with the regulations and the facility's closure plan as revised on November 9, 1987 including an additional distilled deionized water rinse of sample devices following the non-phosphate detergent wash.

Ralph A Brummer

Signature

July 29, 1988

Date

13579

Professional Engineering License Number

New Jersey

For State of

122 Sherman Avenue, Cedar Grove, NJ 07009 (201) 239-1258

Business Address and Telephone Number

OWNER CERTIFICATION OF CLOSURE

I, PETER J. HOLOWACHUK, of

(Owner or Operator)

SERVOMETER CORPORATION, 501 LITTLE FALLS ROAD, CEDAR GROVE, N.J. 07009 hereby

(Name and Address of Facility)

state and certify that, to the best of my knowledge and belief, the UNDERGROUND WASTE CAUSTIC STORAGE TANK at the above named facility has been closed in accordance with the regulations and the facility's closure plan, and that closure was completed on the 29th day of AUGUST, 19 88.

Peter J. Holowachuk

Signature

8/29/88

Date

LANCY ENVIRONMENTAL SERVICES COMPANY
DIVISION OF LANCY INTERNATIONAL, INC.
An Alcoa Separations Technology Company

P.O. Box 419, Pittsburgh, Pennsylvania 15230-0419 (412) 772-0044 FAX (412) 772-1360 Telex 86-6258
Street Address: 181 Thorn Hill Road, Warrendale, Pennsylvania 15086-7527

RECEIVED
DEC 23
HAZARDOUS WASTE MANAGEMENT PROGRAMS

December 17, 1987

Ms. Denise Bear
New Jersey Department of Environmental Protection
Division of Hazardous Site Mitigation
Bureau of Environmental Measurements and Quality Assurance
383 West State Street
Trenton, NJ 08618

Dear Ms. Bear:

Please find enclosed a copy of the analytical data required by your office related to the Servometer Corporation's underground storage tank closure.

We would greatly appreciate your expeditious review of this data as Servometer wishes to complete closure by the end of 1987.

If you should have any questions or comments concerning the data submitted by U.S. Testing Company, Inc., please feel free to call me.

Sincerely,

Lancy Environmental Services Company

Jeffrey S. Holmes

Jeffrey S. Holmes, P.E.
Environmental Engineer

JSH:csb
Enclosure
cc: Peter Holowachuk - Servometer Corporation
George Mejia - NJDEP

United States Testing Company, Inc.
Chemical Services Division
1415 PARK AVENUE • HOBOKEN, NEW JERSEY 07030 • 201-792-2400

REPORT OF TEST

December 10, 1987

NUMBER 75761

CLIENT: Lancy Internaitonal Inc.
181 Thorn Hill Road
Warrendale, PA 15086
Attn: Jeff Holmes

SUBJECT: Seven (7) samples identified as #1, #2, #3, #4, Water sample 6, Field Blank and Trip Blank, submitted on 12/7/87

AUTHORIZATION:

Purchase Order # 25066

PURPOSE:

Analyze samples for Aluminum, Arsenic, Oil & Grease and pH

PROCEDURE:

Samples were analzyed in accordance with the following methods:

"Methods for Chemical Analysis of Water and Wastes," USEPA, Environmental Monitoring and Support Laboratory, Cincinnati, Ohio, March, 1979, EPA-600/4-79-020

"Test Methods for Evaluating Solid Waste, Physical/Chemical Methods," USEPA, Office of Solid Waste and Emergency Response, Washington DC, July 1983 SW-846, 2nd edition

RESULTS:

	# 1	# 2	# 3	# 4
pH*	7.05	7.60	7.70	10.30
Oil & Grease, mg/kg	<10.	<10.	<10.	<10.

* pH done on 1:10 leachate

Metals results attached

SIGNED FOR THE COMPANY

BY

Maryann Gambino

SM

Form 803

U.S. EPA Contract Laboratory Program
Sample Management Office
P.O. Box 818 - Alexandria, VA 22313
703/557-2490 FTS: 8-557-2490

Date 12/9/87

COVER PAGE
INORGANIC ANALYSES DATA PACKAGE

Lab Name US Testing

Case No. 75761

SOW No. 784

Q.C. Report No. 761

Sample Numbers

EPA No.	Lab ID No.	EPA No.	Lab ID No.
#1	75761-1		
#2	-2		
#3	-3		
#4	-4		
Water sample	-5		
Field Blank	-6		
Trip Blank	-7		

Comments:

ICP Interelement and background corrections applied? Yes ✓ No ____.

If yes, corrections applied before ✓ or after ______ generation of raw data.

Footnotes:

NR - not required by contract at this time

Form I:

Value - If the result is a value greater than or equal to the instrument detection limit but less than the contract required detection limit, report the value in brackets (i.e., [10]). Indicate the analytical method used with P (for ICP/Flame AA) or F (for furnace).

U - Indicates element was analyzed for but not detected. Report with the detection limit value (e.g., 10U).

E - Indicates a value estimated or not reported due to the presence of interference. Explanatory note included on cover page.

s - Indicates value determined by Method of Standard Addition.

R - Indicates spike sample recovery is not within control limits.

* - Indicates duplicate analysis is not within control limits.

+ - Indicates the correlation coefficient for method of standard addition is less than 0.995

Form I

U.S. EPA Contract Laboratory Program
Sample Management Office
P.O. Box 818 - Alexandria, VA 22313
703/557-2490 FTS: 8-557-2490

EPA Sample No.
#1

Date 12/9/87

INORGANIC ANALYSIS DATA SHEET

LAB NAME US Testing

CASE NO. 75761

SOW NO. 784

LAB SAMPLE ID. NO. 75761-1

QC REPORT NO. 761

Elements Identified and Measured

Concentration: Low X Medium ______

Matrix: Water ______ Soil- X Sludge ______ Other ______

ug/L or mg/kg dry weight (Circle One)

1.	Aluminum	7260. P	13.	Magnesium	
2.	Antimony		14.	Manganese	
3.	Arsenic	2.18 F	15.	Mercury	
4.	Barium		16.	Nickel	
5.	Beryllium		17.	Potassium	
6.	Cadmium		18.	Selenium	
7.	Calcium		19.	Silver	
8.	Chromium		20.	Sodium	
9.	Cobalt		21.	Thallium	
10.	Copper		22.	Tin	
11.	Iron		23.	Vanadium	
12.	Lead		24.	Zinc	
	Cyanide			Percent Solids (%)	

Footnotes: For reporting results to EPA, standard result qualifiers are used as defined on Cover Page. Additional flags or footnotes explaining results are encouraged. Definition of such flags must be explicit and contained on Cover Page, however.

Comments:

Lab Manager

Form I

U.S. EPA Contract Laboratory Program
Sample Management Office
P.O. Box 818 - Alexandria, VA 22313
703/557-2490 FTS: 8-557-2490

EPA Sample No. #2

Date 12/9/87

INORGANIC ANALYSIS DATA SHEET

LAB NAME US Testing

CASE NO. 75761

SOW NO. 784

LAB SAMPLE ID. NO. 75761-2

QC REPORT NO. 761

Elements Identified and Measured

Concentration: Low X Medium ______

Matrix: Water ______ Soil X Sludge ______ Other ______

ug/L or mg/kg dry weight (Circle One)

1.	Aluminum	7910 P	13.	Magnesium	
2.	Antimony		14.	Manganese	
3.	Arsenic	1.48 F	15.	Mercury	
4.	Barium		16.	Nickel	
5.	Beryllium		17.	Potassium	
6.	Cadmium		18.	Selenium	
7.	Calcium		19.	Silver	
8.	Chromium		20.	Sodium	
9.	Cobalt		21.	Thallium	
10.	Copper		22.	Tin	
11.	Iron		23.	Vanadium	
12.	Lead		24.	Zinc	
	Cyanide			Percent Solids (%)	

Footnotes: For reporting results to EPA, standard result qualifiers are used as defined on Cover Page. Additional flags or footnotes explaining results are encouraged. Definition of such flags must be explicit and contained on Cover Page, however.

Comments: ______

Lab Manager ______

Form I

U.S. EPA Contract Laboratory Program
Sample Management Office
P.O. Box 818 - Alexandria, VA 22313
703/557-2490 FTS: 8-557-2490

EPA Sample No. #3

Date 12/9/87

INORGANIC ANALYSIS DATA SHEET

LAB NAME US Testing

CASE NO. 75761

SOW NO. 784

LAB SAMPLE ID. NO. 75761-3

QC REPORT NO. 761

Elements Identified and Measured

Concentration: Low X Medium ______

Matrix: Water ______ Soil X Sludge ______ Other ______

ug/L or mg/kg dry weight (Circle One)

1. Aluminum	8590 P	13. Magnesium	
2. Antimony		14. Manganese	
3. Arsenic	<1.0 F	15. Mercury	
4. Barium		16. Nickel	
5. Beryllium		17. Potassium	
6. Cadmium		18. Selenium	
7. Calcium		19. Silver	
8. Chromium		20. Sodium	
9. Cobalt		21. Thallium	
10. Copper		22. Tin	
11. Iron		23. Vanadium	
12. Lead		24. Zinc	
Cyanide		Percent Solids (%)	

Footnotes: For reporting results to EPA, standard result qualifiers are used as defined on Cover Page. Additional flags or footnotes explaining results are encouraged. Definition of such flags must be explicit and contained on Cover Page, however.

Comments:

Lab Manager

<u>**Form I**</u>

U.S. EPA Contract Laboratory Program
Sample Management Office
P.O. Box 818 - Alexandria, VA 22313
703/557-2490 FTS: 8-557-2490

EPA Sample No. #4

Date 12/9/87

INORGANIC ANALYSIS DATA SHEET

LAB NAME US Testing CASE NO. 75761

SOW NO. 784

LAB SAMPLE ID. NO. 75761-4 QC REPORT NO. 761

<u>Elements Identified and Measured</u>

Concentration: Low X Medium ____

Matrix: Water ____ Soil X Sludge ____ Other ____

ug/L or mg/kg dry weight (Circle One)

1.	Aluminum	11400. P	13.	Magnesium	
2.	Antimony		14.	Manganese	
3.	Arsenic	1.27 F	15.	Mercury	
4.	Barium		16.	Nickel	
5.	Beryllium		17.	Potassium	
6.	Cadmium		18.	Selenium	
7.	Calcium		19.	Silver	
8.	Chromium		20.	Sodium	
9.	Cobalt		21.	Thallium	
10.	Copper		22.	Tin	
11.	Iron		23.	Vanadium	
12.	Lead		24.	Zinc	
	Cyanide			Percent Solids (%)	

Footnotes: For reporting results to EPA, standard result qualifiers are used as defined on Cover Page. Additional flags or footnotes explaining results are encouraged. Definition of such flags must be explicit and contained on Cover Page, however.

Comments: ____

Lab Manager [signature]

Form I

U.S. EPA Contract Laboratory Program
Sample Management Office
P.O. Box 818 - Alexandria, VA 22313
703/557-2490 FTS: 8-557-2490

EPA Sample No. Water Sample

Date 12/9/87

INORGANIC ANALYSIS DATA SHEET

LAB NAME US Testing — CASE NO. 75761

SOW NO. 784

LAB SAMPLE ID. NO. 75761-5 — QC REPORT NO. 761

Elements Identified and Measured

Concentration: Low X Medium ____

Matrix: Water X Soil ____ Sludge ____ Other ____

ug/L or mg/kg dry weight (Circle One)

1.	Aluminum	51000 P	13.	Magnesium	
2.	Antimony		14.	Manganese	
3.	Arsenic	F	15.	Mercury	
4.	Barium		16.	Nickel	
5.	Beryllium		17.	Potassium	
6.	Cadmium		18.	Selenium	
7.	Calcium		19.	Silver	
8.	Chromium		20.	Sodium	
9.	Cobalt		21.	Thallium	
10.	Copper		22.	Tin	
11.	Iron		23.	Vanadium	
12.	Lead		24.	Zinc	
	Cyanide			Percent Solids (%)	

Footnotes: For reporting results to EPA, standard result qualifiers are used as defined on Cover Page. Additional flags or footnotes explaining results are encouraged. Definition of such flags must be explicit and contained on Cover Page, however.

Comments:

Lab Manager

Form I

U.S. EPA Contract Laboratory Program
Sample Management Office
P.O. Box 818 - Alexandria, VA 22313
703/557-2490 FTS: 8-557-2490

EPA Sample No.
Field Blank

Date 12/9/87

INORGANIC ANALYSIS DATA SHEET

LAB NAME US Testing CASE NO. 75761

SOW NO. 784

LAB SAMPLE ID. NO. 75761-6 QC REPORT NO. 761

Elements Identified and Measured

Concentration: Low X Medium ____

Matrix: Water X Soil ____ Sludge ____ Other ____

ug/L or mg/kg dry weight (Circle One)

1.	Aluminum	190 P	13.	Magnesium	
2.	Antimony		14.	Manganese	
3.	Arsenic	<10. F	15.	Mercury	
4.	Barium		16.	Nickel	
5.	Beryllium		17.	Potassium	
6.	Cadmium		18.	Selenium	
7.	Calcium		19.	Silver	
8.	Chromium		20.	Sodium	
9.	Cobalt		21.	Thallium	
10.	Copper		22.	Tin	
11.	Iron		23.	Vanadium	
12.	Lead		24.	Zinc	
	Cyanide			Percent Solids (%)	

Footnotes: For reporting results to EPA, standard result qualifiers are used as defined on Cover Page. Additional flags or footnotes explaining results are encouraged. Definition of such flags must be explicit and contained on Cover Page, however.

Comments: ____

Lab Manager [signature]

Form I

U.S. EPA Contract Laboratory Program
Sample Management Office
P.O. Box 818 - Alexandria, VA 22313
703/557-2490 FTS: 8-557-2490

EPA Sample No. Trip Blank

Date 12/9/87

INORGANIC ANALYSIS DATA SHEET

LAB NAME US Testing

CASE NO. 75761

SOW NO. 784

LAB SAMPLE ID. NO. 75761-7

QC REPORT NO. 761

Elements Identified and Measured

Concentration: Low X Medium ____

Matrix: Water X Soil ____ Sludge ____ Other ____

ug/L or mg/kg dry weight (Circle One)

1.	Aluminum	120 P	13.	Magnesium	
2.	Antimony		14.	Manganese	
3.	Arsenic	<10 F	15.	Mercury	
4.	Barium		16.	Nickel	
5.	Beryllium		17.	Potassium	
6.	Cadmium		18.	Selenium	
7.	Calcium		19.	Silver	
8.	Chromium		20.	Sodium	
9.	Cobalt		21.	Thallium	
10.	Copper		22.	Tin	
11.	Iron		23.	Vanadium	
12.	Lead		24.	Zinc	
	Cyanide			Percent Solids (%)	

Footnotes: For reporting results to EPA, standard result qualifiers are used as defined on Cover Page. Additional flags or footnotes explaining results are encouraged. Definition of such flags must be explicit and contained on Cover Page, however.

Comments: ____

Lab Manager ____

Form II

Q. C. Report No. 761

INITIAL AND CONTINUING CALIBRATION VERIFICATION[3]

LAB NAME US Testing CASE NO. 75761

SOW NO. 784

DATE 12/9/87 UNITS µg/l

Compound Metals:	Initial Calib.[1] True Value	Found	%R	Continuing Calibration[2] True Value	Found	%R	Found	%R	Method[4]
1. Aluminum	5000	5497	109.9	10000	10430	104.3			P
2. Antimony	900			2500					P
3. Arsenic	40.9	42.1	102.9	50	46	92.0			F
4. Barium	1200			2500					P
5. Beryllium	1000			500					P
6. Cadmium	250			2500					P
7. Calcium	75000			25000					P
8. Chromium	1000			2500					P
9. Cobalt	1000			2500					P
10. Copper	1000			2500					P
11. Iron	1000			2500					P
12. Lead	91.7			50					F
13. Magnesium	5000			25000					P
14. Manganese	1000			2500					P
15. Mercury									COLD VAPOR
16. Nickel	1000			2500					P
17. Potassium	15000			25000					P
18. Selenium	86.4			50					F
19. Silver	300			500					P
20. Sodium	15000			25000					P
21. Thallium	95.2			50					F
22. Tin	100			100					F
23. Vanadium	2500			2500					P
24. Zinc	1000			2500					P
Other:									
Cyanide									WET METHOD

[1] Initial Calibration Source EPA [2] Continuing Calibration Source AA STDS

[3] Control Limits: Mercury and Tin 80-120; All Other Compounds 90-110

[4] Indicate Analytical Method Used: P - ICP/Flame AA; F - Furnace

Form III

Q. C. Report No. 761

BLANKS

LAB NAME US Testing

DATE 12/9/87

CASE NO. 75761

UNITS µg/l

Matrix Water+Soil

Preparation Compound	Initial Calibration Blank Value	Continuing Calibration Blank Value 1	2	3	4	Preparation Blank 1	2
Metals:							
1. Aluminum	38U	38U				38U	
2. Antimony							
3. Arsenic	8.2U	8.2U				8.2U	
4. Barium							
5. Beryllium							
6. Cadmium							
7. Calcium							
8. Chromium							
9. Cobalt							
10. Copper							
11. Iron							
12. Lead							
13. Magnesium							
14. Manganese							
15. Mercury							
16. Nickel							
17. Potassium							
18. Selenium							
19. Silver							
20. Sodium							
21. Thallium							
22. Tin							
23. Vanadium							
24. Zinc							
Other:							
Cyanide							

Form IV

Q. C. Report No. 761

ICP INTERFERENCE CHECK SAMPLE

LAB NAME US Testing

DATE 12/9/87

CASE NO. 75761

Check Sample I.D. ICAP Intercheck

Check Sample Source EPA

Units ug/l

Compound	Control Limits[1] Mean	Std. Dev.	True[2]	Initial Observed	%R	Final Observed	%R
Metals:							
1. Aluminum			503000	497000	98.8	492000	97.8
2. Antimony							
3. Arsenic							
4. Barium			472				
5. Beryllium			456				
6. Cadmium			964				
7. Calcium			499000				
8. Chromium			985				
9. Cobalt			478				
10. Copper			509				
11. Iron			198000				
12. Lead							
13. Magnesium			497000				
14. Manganese			522				
15. Mercury							
16. Nickel			913				
17. Potassium							
18. Selenium							
19. Silver			986				
20. Sodium							
21. Thallium							
22. Tin							
23. Vanadium			471				
24. Zinc			948				
Other:							

1 Mean value based on n = ______.

2 True value of EPA ICP Interference Check Sample or contractor standard.

Form V

Q. C. Report No. 761

SPIKE SAMPLE RECOVERY

LAB NAME US Testing

DATE 12/9/87

CASE NO. 75761

EPA Sample No. Water Sample

Lab Sample ID No. 75761-5

Units µg/l

Matrix Water

Compound	Control Limit %R	Spiked Sample Result (SSR)	Sample Result (SR)	Spiked Added (SA)	%R[1]
Metals:					
1. Aluminum	75-125	52610	51000	2000	80.5
2. Antimony	"			500	
3. Arsenic	"			20	
4. Barium	"			2000	
5. Beryllium	"			50	
6. Cadmium	"			50	
7. Calcium	"			100000	
8. Chromium	"			200	
9. Cobalt	"			500	
10. Copper	"			250	
11. Iron	"			1000	
12. Lead	"			20	
13. Magnesium	"			50000	
14. Manganese	"			200	
15. Mercury	"			1.0	
16. Nickel	"			400	
17. Potassium	"			50000	
18. Selenium	"			10	
19. Silver	"			50	
20. Sodium	"			100000	
21. Thallium	"			50	
22. Tin	"			200	
23. Vanadium	"			500	
24. Zinc	"			200	
Other:					
Cyanide	"				

[1] %R = [(SSR - SR)/SA] x 100

"R"- out of control

Comments:

Form V

Q. C. Report No. 761

SPIKE SAMPLE RECOVERY

LAB NAME US Testing

DATE 12/9/87

CASE NO. 75761

EPA Sample No. #1

Lab Sample ID No. 75761-1

Units ~~ug/l~~ *

Matrix Soil

Compound	Control Limit %R	Spiked Sample Result (SSR)	Sample Result (SR)	Spiked Added (SA)	%R[1]
Metals:					
1. Aluminum	75-125				
2. Antimony	"			500	
3. Arsenic	"	57.2	21.8	40	88.5
4. Barium	"			2000	
5. Beryllium	"			50	
6. Cadmium	"			50	
7. Calcium	"				
8. Chromium	"			200	
9. Cobalt	"			500	
10. Copper	"			250	
11. Iron	"				
12. Lead	"			40	
13. Magnesium	"				
14. Manganese	"			500	
15. Mercury	"			1.0	
16. Nickel	"			500	
17. Potassium	"				
18. Selenium	"			10	
19. Silver	"			50	
20. Sodium	"				
21. Thallium	"			50	
22. Tin	"			200	
23. Vanadium	"			500	
24. Zinc	"			500	
Other:					
Cyanide	"				

[1] %R = [(SSR - SR)/SA] x 100

"R"- out of control

Comments: * Based on diluted solution

Form VI

Q. C. Report No. 761

DUPLICATES

LAB NAME U S Testing

DATE 12/9/87

CASE NO. 75761

EPA Sample No.

Lab Sample ID No. 75761-5

Units ug/l

Matrix Water

Compound	Control Limit[1]	Sample(S)	Duplicate(D)	RPD[2]
Metals:				
1. Aluminum		51000	48600	4.8
2. Antimony				
3. Arsenic				
4. Barium				
5. Beryllium				
6. Cadmium				
7. Calcium				
8. Chromium				
9. Cobalt				
10. Copper				
11. Iron				
12. Lead				
13. Magnesium				
14. Manganese				
15. Mercury				
16. Nickel				
17. Potassium				
18. Selenium				
19. Silver				
20. Sodium				
21. Thallium				
22. Tin				
23. Vanadium				
24. Zinc				
Other:				
Cyanide				

* Out of Control

1 To be added at a later date.

2 $RPD = [|S - D|/((S + D)/2)] \times 100$

NC - Non calculable RPD due to value(s) less than CRDL

Form VI

Q. C. Report No. 761

DUPLICATES

LAB NAME US Testing

DATE 12/9/87

CASE NO. 75761

EPA Sample No. #1

Lab Sample ID No. 75761-1

Units mg/kg

Matrix Soil

Compound	Control Limit[1]	Sample(S)	Duplicate(D)	RPD[2]
Metals:				
1. Aluminum		72600	75900	4.4
2. Antimony				
3. Arsenic		21.8	18.7	15.3
4. Barium				
5. Beryllium				
6. Cadmium				
7. Calcium				
8. Chromium				
9. Cobalt				
10. Copper				
11. Iron				
12. Lead				
13. Magnesium				
14. Manganese				
15. Mercury				
16. Nickel				
17. Potassium				
18. Selenium				
19. Silver				
20. Sodium				
21. Thallium				
22. Tin				
23. Vanadium				
24. Zinc				
Other:				
Cyanide				

* Out of Control

[1] To be added at a later date.

[2] RPD = [|S - D|/((S + D)/2)] x 100

NC - Non calculable RPD due to value(s) less than CRDL

Form VII

Q.C. Report No. 761

INSTRUMENT DETECTION LIMITS AND

LABORATORY CONTROL SAMPLE

LAB NAME US Testing

CASE NO. 75761

DATE 12/9/87

LCS UNITS ug/L mg/kg (Circle One)

Compound	Required Detection Limits (CRDL)-ug/l	Instrument Detection Limits (IDL)-ug/l ICP/AA	Furnace	Lab Control Sample True	Found	%R
Metals:						
1. Aluminum	200	38		1000	1097	109.7
2. Antimony	60	21		1000		
3. Arsenic	10		8.2	40	35	87.5
4. Barium	200	3.9		1000		
5. Beryllium	5	1.1		1000		
6. Cadmium	5	2.3		1000		
7. Calcium	5000	54		20000		
8. Chromium	10	3.6		1000		
9. Cobalt	50	3.0		1000		
10. Copper	25	8.5		1000		
11. Iron	100	5.1		1000		
12. Lead	5		5.0	25		
13. Magnesium	5000	38		20000		
14. Manganese	15	2.1		1000		
15. Mercury	0.2	0.1				
16. Nickel	40	9.7		1000		
17. Potassium	5000	107		20000		
18. Selenium	5		5.0	25		
19. Silver	10	4.0		1000		
20. Sodium	5000	24		20000		
21. Thallium	10		7.2	50		
22. Tin	40		33	200		
23. Vanadium	50	3.9		1000		
24. Zinc	20	2.6		1000		
Other:						
Cyanide	10					

REFERENCE NO. 27

Please print or type in the unshaded areas only
(fill–in areas are spaced for elite type, i.e., 12 characters/inch).

Form Approved OMB No. 158-R0175

FORM 1 GENERAL

EPA

U.S. ENVIRONMENTAL PROTECTION AGENCY

GENERAL INFORMATION

Consolidated Permits Program

(Read the "General Instructions" before starting.)

I. EPA I.D. NUMBER

F NJD002138543

LABEL ITEMS

I. EPA I.D. NUMBER: NJD002138543

III. FACILITY NAME

V. FACILITY MAILING ADDRESS: ~~SERVOMETER CORP~~ ~~501 LITTLE FALLS RD~~ ~~CEDAR GROVE, NJ 07009~~

VI. FACILITY LOCATION: ~~501 LITTLE FALLS RD~~ ~~CEDAR GROVE, NJ 07009~~

GENERAL INSTRUCTIONS

If a preprinted label has been provided, af[fix] it in the designated space. Review the infor[m]ation carefully; if any of it is incorrect, cr[oss] through it and enter the correct data in [the] appropriate fill–in area below. Also, if any [of] the preprinted data is absent *(the area to [the] left of the label space lists the informati[on] that should appear)*, please provide it in [the] proper fill–in area(s) below. If the label [is] complete and correct, you need not compl[ete] Items I, III, V, and VI *(except VI-B wh[ich] must be completed regardless)*. Complete [all] items if no label has been provided. Refe[r to] the instructions for detailed item descr[ip]tions and for the legal authorizations un[der] which this data is collected.

II. POLLUTANT CHARACTERISTICS

INSTRUCTIONS: Complete A through J to determine whether you need to submit any permit application forms to the EPA. If you answer "yes" to any questions, you must submit this form and the supplemental form listed in the parenthesis following the question. Mark "X" in the box in the third column if the supplemental form is attached. If you answer "no" to each question, you need not submit any of these forms. You may answer "no" if your activity is excluded from permit requirements; see Section C of the instructions. See also, Section D of the instructions for definitions of bold–faced terms.

SPECIFIC QUESTIONS	YES	NO	FORM ATTACHED
A. Is this facility a **publicly owned treatment works** which results in a **discharge** to **waters of the U.S.**? (FORM 2A)		X	
B. Does or will this facility *(either existing or proposed)* include a **concentrated animal feeding operation** or **aquatic animal production facility** which results in a **discharge** to **waters of the U.S.**? (FORM 2B)		X	
C. Is this a facility which currently results in **discharges** to **waters of the U.S.** other than those described in A or B above? (FORM 2C)	X		
D. Is this a proposed facility *(other than those described in A or B above)* which will result in a **discharge** to **waters of the U.S.**? (FORM 2D)		X	
E. Does or will this facility treat, store, or dispose of **hazardous wastes**? (FORM 3)	X		
F. Do you or will you inject at this facility industrial or municipal effluent below the lowermost stratum containing, within one quarter mile of the well bore, underground sources of drinking water? (FORM 4)		X	
G. Do you or will you inject at this facility any produced water or other fluids which are brought to the surface in connection with conventional oil or natural gas production, inject fluids used for enhanced recovery of oil or natural gas, or inject fluids for storage of liquid hydrocarbons? (FORM 4)		X	
H. Do you or will you inject at this facility fluids for special processes such as mining of sulfur by the Frasch process, solution mining of minerals, in situ combustion of fossil fuel, or recovery of geothermal energy? (FORM 4)		X	
I. Is this facility a proposed **stationary source** which is one of the 28 industrial categories listed in the instructions and which will potentially emit 100 tons per year of any air pollutant regulated under the Clean Air Act and may affect or be located in an **attainment area**? (FORM 5)		X	
J. Is this facility a proposed **stationary source** which is NOT one of the 28 industrial categories listed in the instructions and which will potentially emit 250 tons per year of any air pollutant regulated under the Clean Air Act and may affect or be located in an **attainment area**? (FORM 5)		X	

III. NAME OF FACILITY

1 SKIP SERVOMETER CORPORATION

IV. FACILITY CONTACT

A. NAME & TITLE (last, first, & title)	B. PHONE (area code & no.)
2 HOLOWACHUK MORRIS PRESIDENT	201 785 4630

V. FACILITY MAILING ADDRESS

A. STREET OR P.O. BOX

3 501 LITTLE FALLS ROAD

B. CITY OR TOWN	C. STATE	D. ZIP CODE
4 CEDAR GROVE	NJ	07009

VI. FACILITY LOCATION

A. STREET, ROUTE NO. OR OTHER SPECIFIC IDENTIFIER

5 501 LITTLE ROAD

B. COUNTY NAME

ESSEX

C. CITY OR TOWN	D. STATE	E. ZIP CODE	F. COUNTY CODE (if known)
6 CEDAR GROVE	NJ	07009	

CONTINUED FROM THE FRONT

VII. SIC CODES (4-digit, in order of priority)

A. FIRST		B. SECOND	
7	3811 (specify) ENG INSTRUMENTS & EQUIPMENT	7	3769 (specify) MISSILE & SPACE PARTS
C. THIRD		**D. FOURTH**	
7	3823 (specify) INDUSTRIAL INSTRUMENTS & PARTS	7	3679 (specify) ELECTRONIC COMPONENTS NOT CLASSIFIED

VIII. OPERATOR INFORMATION

A. NAME

8 SERVOMETER CORPORATION

B. Is the name listed in Item VIII-A also the owner? ☒ YES ☐ NO

C. STATUS OF OPERATOR (Enter the appropriate letter into the answer box; if "Other", specify.)

F = FEDERAL
S = STATE
P = PRIVATE
M = PUBLIC (other than federal or state)
O = OTHER (specify)

P (specify) CORPORATION

D. PHONE (area code & no.)

A 201 785 4630

E. STREET OR P.O. BOX

501 LITTLE FALLS ROAD

F. CITY OR TOWN	G. STATE	H. ZIP CODE
B CEDAR GROVE	NJ	07009

IX. INDIAN LAND

Is the facility located on Indian lands?

☐ YES ☒ NO

X. EXISTING ENVIRONMENTAL PERMITS

A. NPDES (Discharges to Surface Water)	D. PSD (Air Emissions from Proposed Sources)
9 N NJ0027847	9 P
B. UIC (Underground Injection of Fluids)	**E. OTHER (specify)**
9 U	9 (specify)
C. RCRA (Hazardous Wastes)	**E. OTHER (specify)**
9 R	9 (specify)

XI. MAP

Attach to this application a topographic map of the area extending to at least one mile beyond property bounderies. The map must show the outline of the facility, the location of each of its existing and proposed intake and discharge structures, each of its hazardous waste treatment, storage, or disposal facilities, and each well where it injects fluids underground. Include all springs, rivers and other surface water bodies in the map area. See instructions for precise requirements.

F9: A/50

XII. NATURE OF BUSINESS (provide a brief description)

SERVOMETER MANUFACTURES MINIATURE METAL ELECTROFORMED BELLOWS. IN ADDITION THE RELATED PRODUCTS; SUCH AS BELLOWS COUPLINGS, BELLOWS CONTACTS AND BELLOWS ASSEMBLIES. FOR THE AEROSPACE INDUSTRY WE PROVIDE INTRICATE ELECTROFORMS.

F9: A/51

XIII. CERTIFICATION (see instructions)

I certify under penalty of law that I have personally examined and am familiar with the information submitted in this application and all attachments and that, based on my inquiry of those persons immediately responsible for obtaining the information contained in the application, I believe that the information is true, accurate and complete. I am aware that there are significant penalties for submitting false information, including the possibility of fine and imprisonment.

A. NAME & OFFICIAL TITLE (type or print)	B. SIGNATURE	C. DATE SIGNED
MORRIS HOLOWACHUK, PRESIDENT	Morris Holowachuk	10/31/80

COMMENTS FOR OFFICIAL USE ONLY

C

REFERENCE NO. 28

Please print or type in the unshaded areas only
(fill-in areas are spaced for elite type, i.e., 12 characters/inch).

Form Approved OMB No. 158-S80004

FORM 3 RCRA

EPA

U.S. ENVIRONMENTAL PROTECTION AGENCY

HAZARDOUS WASTE PERMIT APPLICATION

Consolidated Permits Program

(This information is required under Section 3005 of RCRA.)

I. EPA I.D. NUMBER

F N J D 0 0 2 1 3 8 5 4 3 | T/A 3 | C 1

FOR OFFICIAL USE ONLY

APPLICATION APPROVED	DATE RECEIVED (yr., mo., & day)	COMMENTS
	8 0 1 1 1 9	

II. FIRST OR REVISED APPLICATION

Place an "X" in the appropriate box in A or B below *(mark one box only)* to indicate whether this is the first application you are submitting for your facility or a revised application. If this is your first application and you already know your facility's EPA I.D. Number, or if this is a revised application, enter your facility's EPA I.D. Number in Item I above.

A. FIRST APPLICATION *(place an "X" below and provide the appropriate date)*

[X] 1. EXISTING FACILITY *(See instructions for definition of "existing" facility. Complete item below.)*

[ ] 2. NEW FACILITY *(Complete item below.)*

C 8 | YR. 7 4 | MO. 0 8 | DAY 0 1 — FOR EXISTING FACILITIES, PROVIDE THE DATE *(yr., mo., & day)* OPERATION BEGAN OR THE DATE CONSTRUCTION COMMENCED *(use the boxes to the left)*

YR. | MO. | DAY — FOR NEW FACILITIES, PROVIDE THE DATE *(yr., mo., & day)* OPERATION BEGAN OR IS EXPECTED TO BEGIN

B. REVISED APPLICATION *(place an "X" below and complete Item I above)*

[ ] 1. FACILITY HAS INTERIM STATUS

[ ] 2. FACILITY HAS A RCRA PERMIT

III. PROCESSES – CODES AND DESIGN CAPACITIES

A. PROCESS CODE — Enter the code from the list of process codes below that best describes each process to be used at the facility. Ten lines are provided for entering codes. If more lines are needed, enter the code*(s)* in the space provided. If a process will be used that is not included in the list of codes below, then describe the process *(including its design capacity)* in the space provided on the form *(Item III-C)*.

B. PROCESS DESIGN CAPACITY — For each code entered in column A enter the capacity of the process.
1. AMOUNT — Enter the amount.
2. UNIT OF MEASURE — For each amount entered in column B(1), enter the code from the list of unit measure codes below that describes the unit of measure used. Only the units of measure that are listed below should be used.

PROCESS	PROCESS CODE	APPROPRIATE UNITS OF MEASURE FOR PROCESS DESIGN CAPACITY
Storage:		
CONTAINER *(barrel, drum, etc.)*	S01	GALLONS OR LITERS
TANK	S02	GALLONS OR LITERS
WASTE PILE	S03	CUBIC YARDS OR CUBIC METERS
SURFACE IMPOUNDMENT	S04	GALLONS OR LITERS
Disposal:		
INJECTION WELL	D79	GALLONS OR LITERS
LANDFILL	D80	ACRE-FEET *(the volume that would cover one acre to a depth of one foot)* OR HECTARE-METER
LAND APPLICATION	D81	ACRES OR HECTARES
OCEAN DISPOSAL	D82	GALLONS PER DAY OR LITERS PER DAY
SURFACE IMPOUNDMENT	D83	GALLONS OR LITERS
Treatment:		
TANK	T01	GALLONS PER DAY OR LITERS PER DAY
SURFACE IMPOUNDMENT	T02	GALLONS PER DAY OR LITERS PER DAY
INCINERATOR	T03	TONS PER HOUR OR METRIC TONS PER HOUR; GALLONS PER HOUR OR LITERS PER HOUR
OTHER *(Use for physical, chemical, thermal or biological treatment processes not occurring in tanks, surface impoundments or incinerators. Describe the processes in the space provided; Item III-C.)*	T04	GALLONS PER DAY OR LITERS PER DAY

UNIT OF MEASURE	UNIT OF MEASURE CODE
GALLONS	G
LITERS	L
CUBIC YARDS	Y
CUBIC METERS	C
GALLONS PER DAY	U
LITERS PER DAY	V
TONS PER HOUR	D
METRIC TONS PER HOUR	W
GALLONS PER HOUR	E
LITERS PER HOUR	H
ACRE-FEET	A
HECTARE-METER	F
ACRES	B
HECTARES	Q

EXAMPLE FOR COMPLETING ITEM III *(shown in line numbers X-1 and X-2 below)*: A facility has two storage tanks, one tank can hold 200 gallons and the other can hold 400 gallons. The facility also has an incinerator that can burn up to 20 gallons per hour.

C DUP | T/A | C 1

LINE NUMBER	A. PROCESS CODE (from list above)	B. PROCESS DESIGN CAPACITY 1. AMOUNT (specify)	2. UNIT OF MEASURE (enter code)	FOR OFFICIAL USE ONLY
X-1	S 0 2	600	G	
X-2	T 0 3	20	E	
1	S 0 2	8,000,000	G	
2				
3				
4				
5				
6				
7				
8				
9				
10				

Continued from the front.

III. PROCESSES *(continued)*

C. SPACE FOR ADDITIONAL PROCESS CODES OR FOR DESCRIBING OTHER PROCESSES *(code "T04")*. FOR EACH PROCESS ENTERED HERE INCLUDE DESIGN CAPACITY.

IV. DESCRIPTION OF HAZARDOUS WASTES

A. **EPA HAZARDOUS WASTE NUMBER** – Enter the four–digit number from 40 CFR, Subpart D for each listed hazardous waste you will handle. If you handle hazardous wastes which are not listed in 40 CFR, Subpart D, enter the four–digit number*(s)* from 40 CFR, Subpart C that describes the characteristics and/or the toxic contaminants of those hazardous wastes.

B. **ESTIMATED ANNUAL QUANTITY** – For each **listed waste** entered in column A estimate the quantity of that waste that will be handled on an annual basis. For each **characteristic** or **toxic contaminant** entered in column A estimate the total annual quantity of all the non–listed waste*(s)* that will be handled which possess that characteristic or contaminant.

C. **UNIT OF MEASURE** – For each quantity entered in column B enter the unit of measure code. Units of measure which must be used and the appropriate codes are:

ENGLISH UNIT OF MEASURE	CODE	METRIC UNIT OF MEASURE	CODE
POUNDS	P	KILOGRAMS	K
TONS	T	METRIC TONS	M

If facility records use any other unit of measure for quantity, the units of measure must be converted into one of the required units of measure taking into account the appropriate density or specific gravity of the waste.

D. **PROCESSES**

1. PROCESS CODES:

For listed hazardous waste: For each **listed** hazardous waste entered in column A select the code*(s)* from the list of process codes contained in Item III to indicate how the waste will be stored, treated, and/or disposed of at the facility.

For non–listed hazardous wastes: For each characteristic or toxic contaminant entered in column A, select the code*(s)* from the list of process codes contained in Item III to indicate **all** the processes that will be used to store, treat, and/or dispose of all the non–listed hazardous wastes that possess that characteristic or toxic contaminant.

Note: Four spaces are provided for entering process codes. If more are needed: (1) Enter the first three as described above; (2) Enter "000" in the extreme right box of Item IV-D(1); and (3) Enter in the space provided on page 4, the line number and the additional code*(s)*.

2. PROCESS DESCRIPTION: If a code is not listed for a process that will be used, describe the process in the space provided on the form.

NOTE: HAZARDOUS WASTES DESCRIBED BY MORE THAN ONE EPA HAZARDOUS WASTE NUMBER – Hazardous wastes that can be described by more than one EPA Hazardous Waste Number shall be described on the form as follows:

1. Select one of the EPA Hazardous Waste Numbers and enter it in column A. On the same line complete columns B,C, and D by estimating the total annual quantity of the waste and describing all the processes to be used to treat, store, and/or dispose of the waste.
2. In column A of the next line enter the other EPA Hazardous Waste Number that can be used to describe the waste. In column D(2) on that line enter "included with above" and make no other entries on that line.
3. Repeat step 2 for each other EPA Hazardous Waste Number that can be used to describe the hazardous waste.

EXAMPLE FOR COMPLETING ITEM IV *(shown in line numbers X-1, X-2, X-3, and X-4 below)* – A facility will treat and dispose of an estimated 900 pounds per year of chrome shavings from leather tanning and finishing operation. In addition, the facility will treat and dispose of three non–listed wastes. Two wastes are corrosive only and there will be an estimated 200 pounds per year of each waste. The other waste is corrosive and ignitable and there will be an estimated 100 pounds per year of that waste. Treatment will be in an incinerator and disposal will be in a landfill.

LINE NO.	A. EPA HAZARD. WASTE NO. *(enter code)*	B. ESTIMATED ANNUAL QUANTITY OF WASTE	C. UNIT OF MEASURE *(enter code)*	D. PROCESSES 1. PROCESS CODES *(enter)*				2. PROCESS DESCRIPTION *(if a code is not entered in D(1))*
X-1	K 0 5 4	900	P	T 0 3	D 8 0			
X-2	D 0 0 2	400	P	T 0 3	D 8 0			
X-3	D 0 0 1	100	P	T 0 3	D 8 0			
X-4	D 0 0 2							included with above

CONTINUE ON PAGE 3

Continued from page 2.
NOTE: Photocopy this page before completing if you have more than 26 wastes to list.

Form Approved OMB No. 158-S80004

EPA I.D. NUMBER (enter from page 1)	T/A	C	FOR OFFICIAL USE ONLY	T/A	C	
W I [illegible] D 0 0 2 1 3 8 5 4 3	3	1	W DUP	3	2	DUP

IV. DESCRIPTION OF HAZARDOUS WASTES *(continued)*

LINE NO.	A. EPA HAZARD. WASTE NO. *(enter code)*	B. ESTIMATED ANNUAL QUANTITY OF WASTE	C. UNIT OF MEASURE *(enter code)*	D. PROCESSES 1. PROCESS CODES *(enter)*				D. PROCESSES 2. PROCESS DESCRIPTION *(if a code is not entered in D(1))*
1	F 0 0 1	2000	T	S 0 2	D 8 3			
2	F 0 0 6	71000	T	S 0 2	D 8 3			
3	F 0 0 9	3000	T	S 0 2	D 8 3			
4	D 0 0 2	104 000	T	S 0 2	D 8 3			
5								
6								
7								
8								
9								
10								
11								
12								
13								
14								
15								
16								
17								
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23								
24								
25								
26								

EPA Form 3510-3 (6-80)

CONTINUE ON REVERSE

Continued from the front.

IV. DESCRIPTION OF HAZARDOUS WASTES *(continued)*

E. USE THIS SPACE TO LIST ADDITIONAL PROCESS CODES FROM ITEM D(1) ON PAGE 3.

F6: A/55 F6: A/56

EPA I.D. NO. *(enter from page 1)*

S		T/A	C
F	NJD002138543	3	6

V. FACILITY DRAWING

All **existing** facilities must include in the space provided on page 5 a scale drawing of the facility *(see instructions for more detail).*

VI. PHOTOGRAPHS

All existing facilities must include photographs *(aerial or ground–level)* that clearly delineate all existing structures; existing storage, treatment and disposal areas; and sites of future storage, treatment or disposal areas *(see instructions for more detail).*

VII. FACILITY GEOGRAPHIC LOCATION

LATITUDE *(degrees, minutes, & seconds)*	LONGITUDE *(degrees, minutes, & seconds)*
40 51 500	074 13 300

VIII. FACILITY OWNER

[X] A. If the facility owner is also the facility operator as listed in Section VIII on Form 1, "General Information", place an "X" in the box to the left and skip to Section IX below.

B. If the facility owner is not the facility operator as listed in Section VIII on Form 1, complete the following items:

1. NAME OF FACILITY'S LEGAL OWNER	2. PHONE NO. *(area code & no.)*
E	

3. STREET OR P.O. BOX	4. CITY OR TOWN	5. ST.	6. ZIP CODE
F	G		

IX. OWNER CERTIFICATION

I certify under penalty of law that I have personally examined and am familiar with the information submitted in this and all attached documents, and that based on my inquiry of those individuals immediately responsible for obtaining the information, I believe that the submitted information is true, accurate, and complete. I am aware that there are significant penalties for submitting false information, including the possibility of fine and imprisonment.

A. NAME *(print or type)*	B. SIGNATURE	C. DATE SIGNED
MORRIS HOLOWACHUK	Morris Holowachuk	10/27/80

X. OPERATOR CERTIFICATION

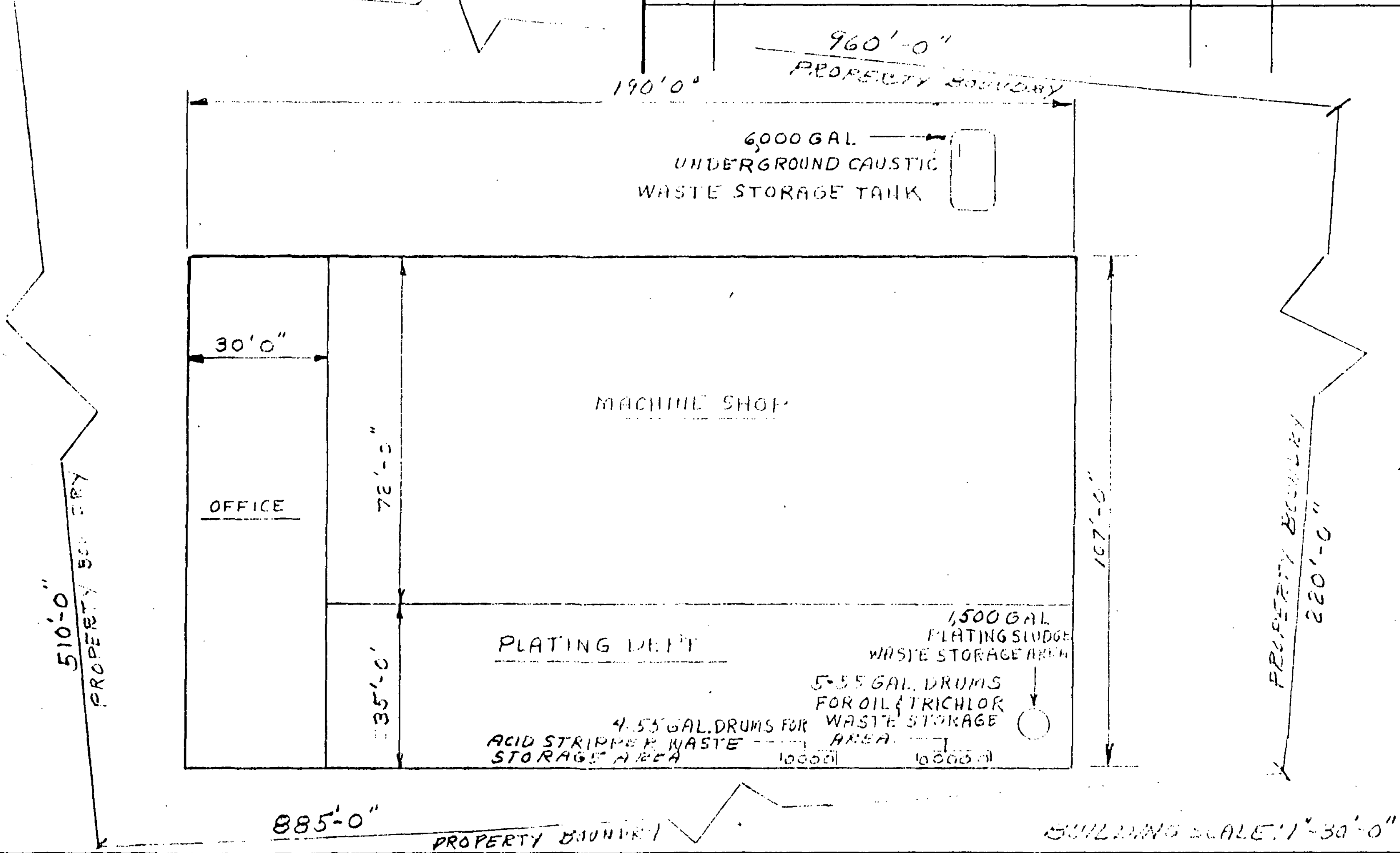
I certify under penalty of law that I have personally examined and am familiar with the information submitted in this and all attached documents, and that based on my inquiry of those individuals immediately responsible for obtaining the information, I believe that the submitted information is true, accurate, and complete. I am aware that there are significant penalties for submitting false information, including the possibility of fine and imprisonment.

A. NAME *(print or type)*	B. SIGNATURE	C. DATE SIGNED

 CONTINUE ON PAGE 5

REVISIONS

SYM	DESCRIPTION	DATE	APPROVAL



FINISH

SCALE | NO. REQ'D

DIMENSIONAL TOLERANCES
UNLESS OTHERWISE SPECIFIED

REMOVE BURRS & BREAK SHARP EDGES APPROX. .005 R
⊥ AND ∥ .001 IN. PER IN.
CONCENTRICITY .005 T I R
SURFACE FINISH RMS 63

XXX DEC. ± .005
XX DEC. ± .015
FRACTIONS ± 1/64
ANGLES ± 1/2°

TITLE
WASTE STORAGE AREAS

CODE IDENT. NO. 18469

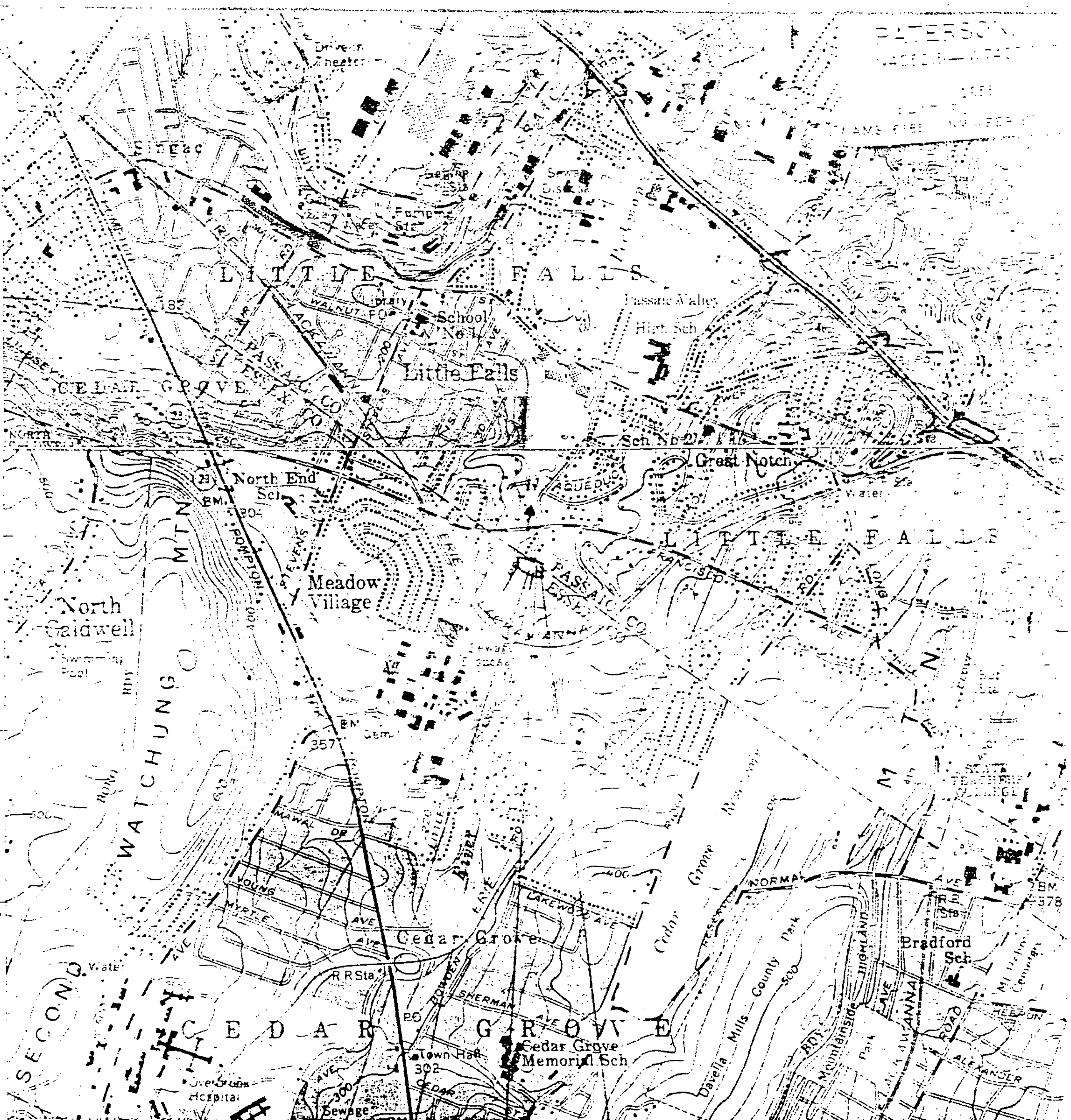
DRAWN S.F.W. DATE 9-9-86
CHECKED DATE
APPROVED DATE

SERVOMETER CORPORATION
501 LITTLE FALLS RD.
CEDAR GROVE, N.J. 07009

SIZE	DRAWING NUMBER	ISSUE
A	16080	

Continued from page 4.

V. FACILITY DRAWING *(see page 4)*



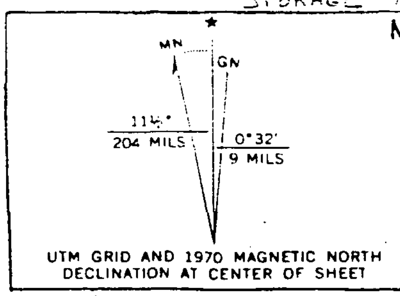
"Treated Discharge Into Peckman River

5-55 Gal. Drums For Oil & Trichlor Waste Storage Area

1,500 Gal. Plating Sludge Waste Storage Area

NOTE: PECKMAN RIVER FLOWS NORTH

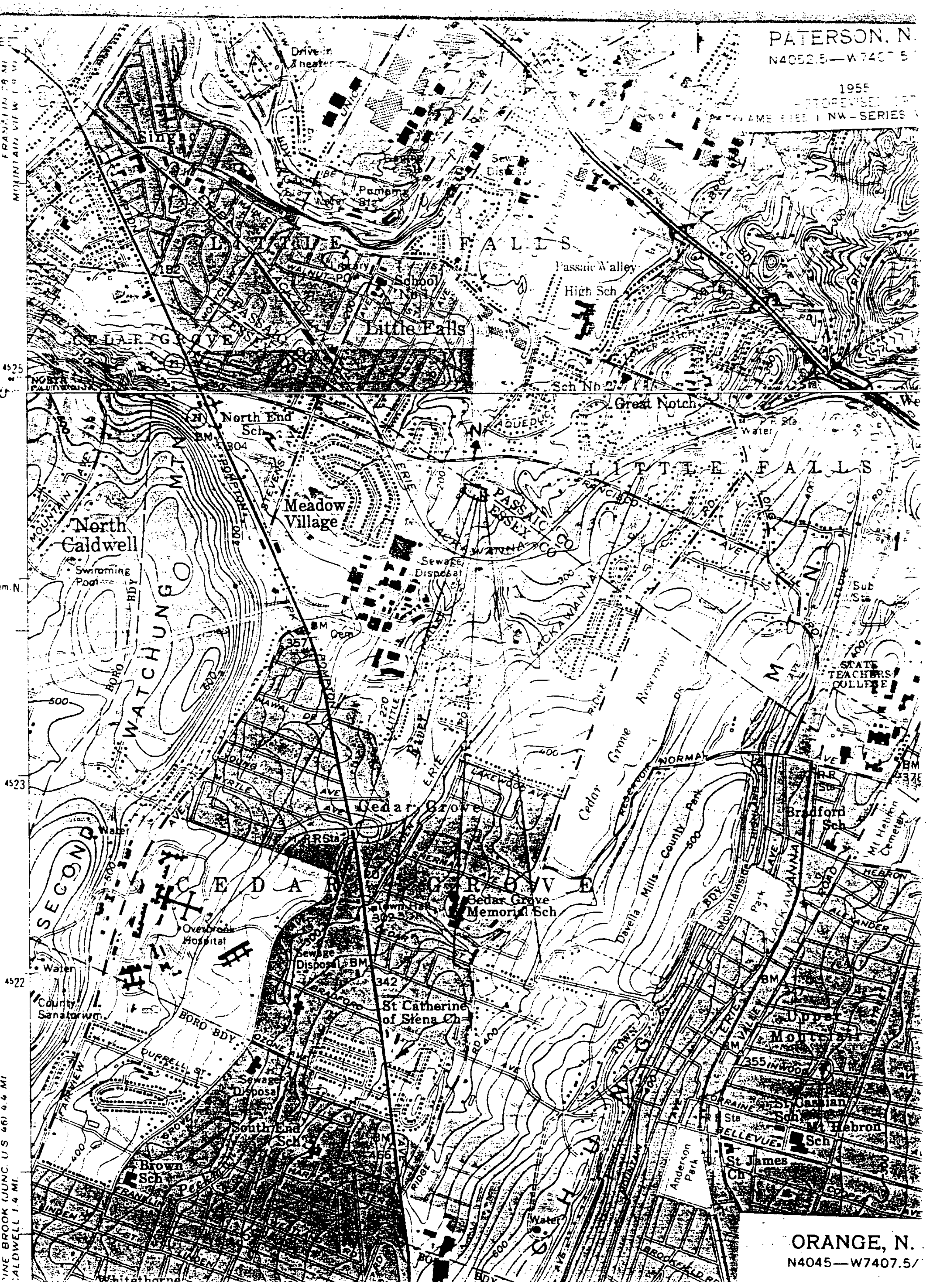
SCALE 1:24,000



SERVOMETER CO.
CEDAR GROVE, N.J.

4-55 Gal. Drums For Acid

6,000 Gal. Underground Caustic Waste Storage Tank



PATERSON, N.
N4052.5—W7407.5
1955
Drive-in Theater
Singac
Pumping Sta
LITTLE FALLS
Passaic Valley High Sch
School No 1
Little Falls
CEDAR GROVE
Great Notch
North End Sch
Meadow Village
North Caldwell
Swimming Pool
WATCHUNG MTN
Sewage Disposal
ERIE
PASSAIC CO
ESSEX CO
LACKAWANNA
STATE TEACHERS COLLEGE
Cedar Grove Reservoir
NORMAL AVE
Cedar Grove
RR Sta
Bradford Sch
Mt Hebron Cemetery
SECOND
CEDAR GROVE
Cedar Grove Memorial Sch
Town Hall
Overbrook Hospital
Davella Mills County Park
Mountainside Park
Water
County Sanatorium
St Catherine of Siena Ch
BORO BDY
Upper Montclair
Sewage Disposal
South End Sch
St Cassian Sch
Mt Hebron Sch
Brown Sch
Anderson Park
St James Ch
BELLEVUE
ORANGE, N.
N4045—W7407.5

REFERENCE NO. 29

Let's protect our earth

State of New Jersey

DEPARTMENT OF ENVIRONMENTAL PROTECTION

DIVISION OF WATER RESOURCES
METRO BUREAU OF REGIONAL ENFORCEMENT

2 BABCOCK PLACE
WEST ORANGE, NEW JERSEY 07052

GEORGE G. McCANN, P.E.
DIRECTOR

November 18, 1988

DIRK C. HOFMAN, P.E.
DEPUTY DIRECTOR

Mr. Peter Holowachuk, President
Servometer Corporation
501 Little Falls Road
Cedar Grove, NJ 07009

Re: Compliance Evaluation Inspection
Servometer Corporation
NJPDES No. NJ0027847
Cedar Grove/Essex County

Dear Mr. Holowachuk:

A Compliance Evaluation Inspection of your facility was conducted by representatives of this Division on October 5, 1988.

Your facility received a rating of "ACCEPTABLE". A copy of the completed inspection report form is enclosed for your information. Please address any minor deficiencies noted therein.

This Division anticipates your continued cooperation in assisting us in the prevention and control of water pollution in New Jersey.

Very truly yours,

Stefan Sedlak

Stefan D. Sedlak
Section Chief
Metro Bureau of
Regional Enforcement

A7:G26

c: Mr. Paul Molinari, USEPA
Dr. Richard Baker, USEPA
Mr. Thomas Restaino, H.O.

bc: Zaheer Hussain
Central File

Form DWR-053
3/81

NEW JERSEY DEPARTMENT OF ENVIRONMENTAL PROTECTION
DIVISION OF WATER RESOURCES
CN 029, Trenton, N.J. 08625

DISCHARGE SURVEILLANCE REPORT

PERMIT # NJ0027847 NO. OF DISCHARGES 001 CLASS maj / Ind.

DISCHARGER Servometer Corporation

OWNER Servometer Corporation

MUNICIPALITY Ceder Grove COUNTY Essex WATERSHED CODE P

LOCATION 501 Little Falls Road 07009

RECEIVING WATERS Peckman River STREAM CLASS FW-2NT

LICENSED OPERATOR & PLANT CLASS Peter Holowachuk N-N

TRAINEE/ASSISTANT — OTHER INFO. (201) 785-4630

DEFICIENCIES OR COMMENTS None

OVERALL RATING ☒ Acceptable ☐ Conditionally Acceptable ☐ Unacceptable

EVALUATOR Steve Ciambruschini / Howard Golding TITLE Environmental Specialist

INFORMATION FURNISHED BY (Name) Mr. Peter Holowachuk

(Title) President (Organization) Servometer Corporation

DATE OF INSPECTION October 5, 1988

Form DWR-053
1/85

NEW(:SEY DEPARTMENT OF ENVIRONMENTAL PR(:TION
DIVISION OF WATER RESOURCES
CN 029, Trenton, N.J. 08625

Permit # NJ0027847

Servometer

DISCHARGE SURVEILLANCE REPORT

Date October 5, 1988

GROUND WATER DISCHARGE EVALUATION

RATING CODES: S = Satisfactory M = Marginal U = Unsatisfactory NA = Not Applicable NI - Not inspected

		RATING	COMMENTS
GENERAL	TYPE DGW	—	Underground Storage Tank
	RCRA FACILITY	—	NJD002138543
	DISCHARGE NUMBER	NA	
	WASTEWATER SOURCE/FREQ.		
	PUMPS AND PIPING		
	ALTERNATE POWER/ALARM		
	BYPASS		
MONITORING SYSTEM	WATER SUPPLY/MONITORING	NA	
	AQUIFERS MONITORED		Glacial + Aluvial deposits overlying Triassic Brunswick Formation and Triassic Watchung Basalt.
	UPGRADIENT WELLS	S	mw-1
	DOWNGRADIENT WELLS	S	mw-2, mw-3, mw-4
	SAMPLING PLAN	—	March, June, Sept, Dec.
	SAMPLING PROCEDURES		Sampling will be carried out in
	LAB CERTIFICATION		October, 1988.
	RECORDS	S	
	REPORTING	—	April, July, Oct., Jan.
LYSIMETER/ MONITORED WELLS	DRILLING PERMIT NUMBERS	S	2612213-8 2612214-6 2612215-4 2612216-2
	WELLS NUMBERED/IDENTIFIED	S	mw1 mw2 mw-3 mw-4
	LOCKS/INTEGRITY	S/S	Good, Good
	ABANDONMENT PLAN	NI	
	ELEVATION INFORMATION	NI	
	WATER LEVEL MEASUREMENT	NI	
	TURBIDITY FREE	NI	
	SUFFICIENT YIELD	NI	
UIC	CLASSIFICATION		
	PERC./LEACHING PROBLEMS		
	SOLVENTS/REPAIRS MADE	NA	
	MAX. PRESSURE & VOLUME		
	CLOSEST USDW/SUPPLY WELLS		
	MOUND INTEGRITY/COVER		
IMPOUNDMENT	LINING INTEGRITY		
	EMBANKMENT INTEGRITY	NA	
	LEACHATE COLLECTION SYS.		
	SOLIDS BUILDUP/REMOVAL		
	HEIGHT TO FREEBOARD		
	APPEARANCE		
LAND APPLICATION/ SPRAY SYSTEM	EVEN DISTRIBUTION		
	PONDING/RUNOFF/EROSION		
	SPRAY HEADS	NA	
	DISCING		
	COVER CROP		
	APPEARANCE		
	BUFFER ZONE		
	SLUDGE STOCKPILED		
OTHER	SEEPAGE/LEACHING		
	ODOR/AEROSOLS	NA	

N.J.D.E.P.
D.W.R.
DISCHARGE SURVEILLANCE REPORT

Permit #: NJ0027847
Date: October 5 1988

INDUSTRIAL TREATMENT PROCESS EVALUATION

RATING CODES: S = Satisfactory M = Marginal U = Unsatisfactory NA = Not Applicable

		RATING	COMMENTS
GENERAL	DISCHARGE # 001	---	
	WASTEWATER SOURCE(S)	---	Process water for electroplating 24 hours/day
	CONTINUITY OF OPERATION	---	5 Days / week
	BYPASSES/OVERFLOWS	NA	
	S.P.C.C. PLAN	NA	
	ALARM SYSTEMS	NA	
	ALTERNATE POWER SUPPLY	NA	
TREATMENT PROCESSES	Pretreatment of Electroplating wastewater (Acid or caustic Addition)	S	
	Clarifier	S	
SLUDGE HANDLING	Waste Sodium Hydroxide Solution	—	Servometer Gen. # NJD002138543
	Transporter	S	Freehold Cartage # NJD054126164
	DISPOSAL SITE	S	E.I. Dupont # NJD002385730 Deepwater, NJ
INFORMATION	FLOW METER & RECORDER	S	Metered
	RECORDS	S	Permit, DMR's
	SAMPLING PROCEDURES	S	Company Personnel
	ANALYSES PERFORMED BY	S	Lancy International INC Cert. # 77269 Zelenople, Pa. Atlantic Environmental is subcontracted by Lancy to do Bioassay
	Electroplating Operation		
OTHER	Metals used in process Ni, Cu, Au, Cr.		
	FINAL EFFLUENT APPEARENCE	S	Clear
	REC. WATERS APPEARENCE	NI	Peckman River

Form DWR-053
3/81

NEW JERSEY DEPARTMENT OF ENVIRONMENTAL PROTECTION
DIVISION OF WATER RESOURCES
CN 029, Trenton, N.J. 08625

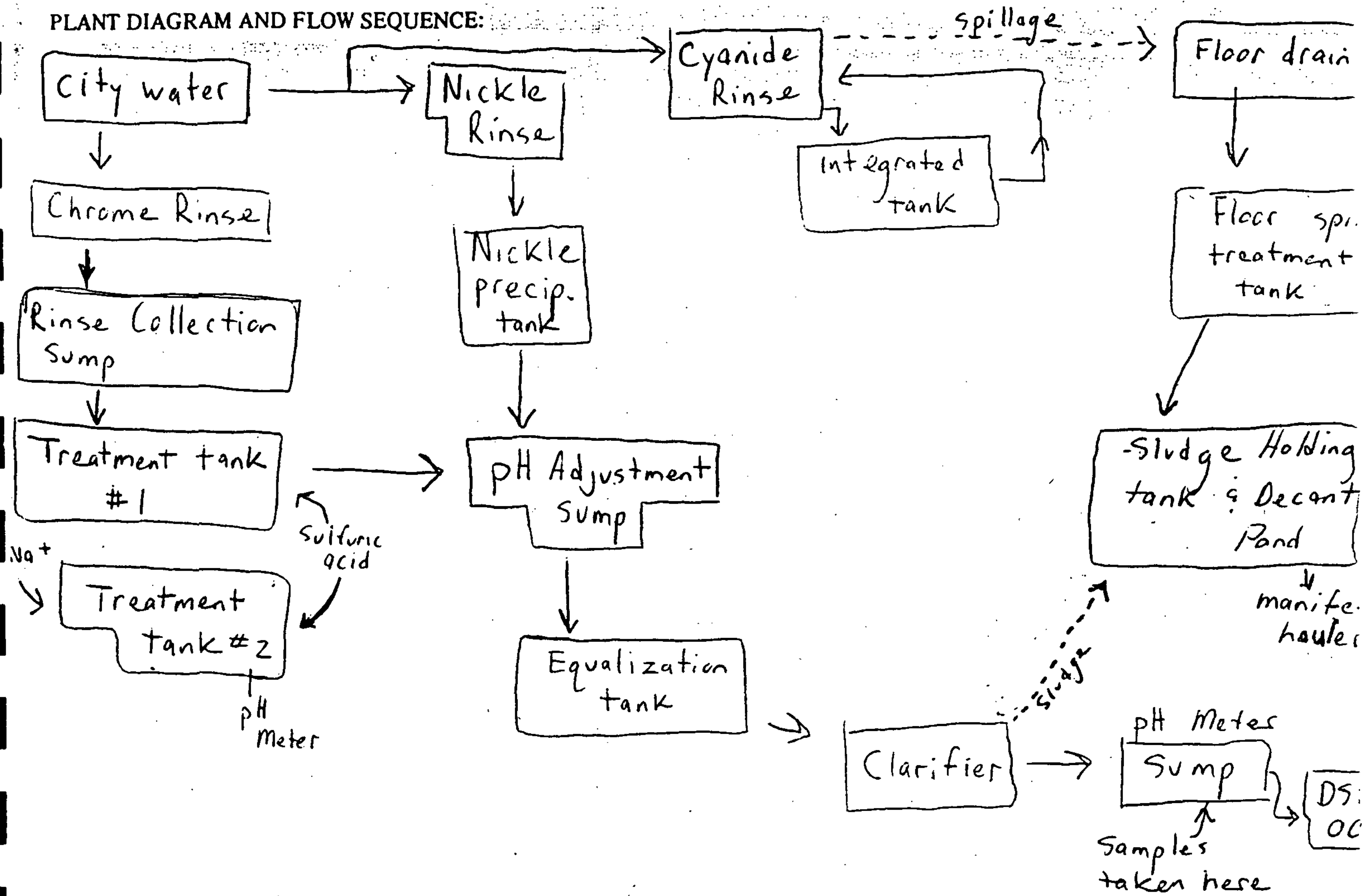
Permit # NJ002784

DISCHARGE SURVEILLANCE REPORT

Servometer

Date October 5, 19

PLANT DIAGRAM AND FLOW SEQUENCE:



No samples taken

DISCHARGE DATA No DMR Violations

SOURCE: DJN 001

PERIOD: June + July 1988

DIS	PARA	SAMPLE TYPE	PERMIT LIMITS	DATA	DIS	PARA	SAMPLE TYPE	PERMIT LIMITS	DATA

MONITORING DEFICIENCIES:

REFERENCE NO. 30

NUS CORPORATION TELECON NOTE

CONTROL NO:	DATE: 6/30/88	TIME: 905

DISTRIBUTION:
PETER RICHARDS TDD 02-8803-55
BRICS NJ648I

BETWEEN: GLENRIDGE C.C.	OF: office	PHONE: (201) 748-8400

AND: STAN SHULFER (NUS)

DISCUSSION:
I spoke with someone in the office, they advised I contact Don, at the greenskeepers phone # 201-748-0883.

910 No answer at greenskeepers phone #

7/5/88 910 Spoke with Don - greenskeeper for Glenridge Country Club. Don advised ~~have~~ that C.C. has 3 wells. Two wells, #1 and #2 are used only for irrigation purposes on the golf course. Well #3 is used to supply water to the swimming pool. This well is located in Glenridge, 1 Block east of Ridgewood

ACTION ITEMS: Avenue at Yantecaw and Forest Avenues. The two irrigation wells are located in Bloomfield.

The 2 irrigation wells were tested by Bloomfield during the last water shortage, when being considered for as an emergency water supply. over →

The swimming pool supply well is ~~used~~ tested for only chlorides on a regular basis.

REFERENCE NO. 31

00.46-C
02-8803-55

NUS CORPORATION — TELECON NOTE

CONTROL NO:	DATE: 7/20/88	TIME: 905

DISTRIBUTION:
Poor Richards
TDD # 02-8803-55
Brizs # NJ648I

BETWEEN: Bob Dickerson	OF: Greenskeeper for Upper Montclair C.C.	PHONE: (201) 779-7505

AND: STAN SHULFER (NUS)

DISCUSSION:
I asked Mr. Dickerson about the 3 wells listed as in use at the Country Club,
Mr. Dickerson advised that well # 1 is used for semi-public drinking water supply, serving the club house. Approximate membership and staff total 1,000 people. Wells # 2 and 3 are used in conjunction with the onsite pond to irrigate approximately 100 acres of golf course.
Only the drinking supply is tested. It is tested for bacteriological quality and nitrates.

ACTION ITEMS:

NUS 067 REVISED 0681

SERVOMETER CORP.
NJD 002138543

02-8904-65-P
REV. NO. 0

O-HRS SCORE
☐-PRO SCORE

CONFIDENTIAL-NOT FOR PUBLIC RELEASE

Ground Water Route Work Sheet

Rating Factor	Assigned Value (Circle One)	Multi-plier	HRS	Max. Score	PRO
1 Observed Release	0 45	1	0	45	0
If observed release is given a score of 45, proceed to line 4. If observed release is given a score of 0, proceed to line 2.					
2 Route Characteristics					
Depth to Aquifer of Concern	0 1 2 3	2	6	6	6
Net Precipitation	0 1 2 3	1	3	3	3
Permeability of the Unsaturated Zone	0 1 2 3	1	2	3	2
Physical State	0 1 2 3	1	3	3	3
	Total Route Characteristics Score		14	15	14
3 Containment	0 1 2 3	1	0	3	1
4 Waste Characteristics					
Toxicity/Persistence	0 3 6 9 12 15 18	1	0	18	0
Hazardous Waste Quantity	0 1 2 3 4 5 6 7 8	1	0	8	0
	Total Waste Characteristics Score		0	26	0
5 Targets					
Ground Water Use	0 1 2 3	3	6	9	9
Distance to Nearest Well/Population Served	0 4 6 8 10 12 16 18 20 24 30 32 35 40	1	30	40	30
	Total Targets Score		36	49	39
6 If line 1 is 45, multiply 1 x 4 x 5 If line 1 is 0, multiply 2 x 3 x 4 x 5			0	57,330	0
7 Divide line 6 by 57,330 and multiply by 100		S_{gw} =	0		0

DECLASSIFIED

Date 9/6/12 Initials JL

02-8704-65-PA
REV. NO. 0

CONFIDENTIAL–NOT FOR PUBLIC RELEASE

Surface Water Route Work Sheet

Rating Factor	Assigned Value (Circle One)	Multi-plier	HRS	Max. Score	PRO
1 Observed Release	0 45	1	0	45	0
If observed release is given a value of 45, proceed to line 4. If observed release is given a value of 0, proceed to line 2.					
2 Route Characteristics					
Facility Slope and Intervening Terrain	0 1 2 3	1	0	3	0
1-yr. 24-hr. Rainfall	0 1 2 3	1	2	3	2
Distance to Nearest Surface Water	0 1 2 3	2	6	6	6
Physical State	0 1 2 3	1	3	3	3
	Total Route Characteristics Score		11	15	11
3 Containment	0 1 2 3	1	0	3	1
4 Waste Characteristics					
Toxicity/Persistence	0 3 6 9 12 15 18	1	0	18	18
Hazardous Waste Quantity	0 1 2 3 4 5 6 7 8	1	0	8	2
	Total Waste Characteristics Score		0	26	20
5 Targets					
Surface Water Use	0 1 2 3	3	3	9	6
Distance to a Sensitive Environment	0 1 2 3	2	0	6	0
Population Served/Distance to Water Intake Downstream	0 4 6 8 10 / 12 16 18 20 / 24 30 32 35 40	1	0	40	0
	Total Targets Score		3	55	6
6 If line 1 is 45, multiply 1 x 4 x 5. If line 1 is 0, multiply 2 x 3 x 4 x 5			0	64,350	1320
7 Divide line 6 by 64,350 and multiply by 100		S_{sw} =	0		2.05

02-8904-65-PA
REV. NO. 0

CONFIDENTIAL-NOT FOR PUBLIC RELEASE

Air Route Work Sheet					
Rating Factor	Assigned Value (Circle One)	Multi-plier	HRS	Max. Score	PRO
1 Observed Release	0 45	1	0	45	0
Date and Location:					
Sampling Protocol:					
If line 1 is 0, the S_a = 0. Enter on line 5 If line 1 is 45, then proceed to line 2					
2 Waste Characteristics					
Reactivity and Incompatibility	0 1 2 3	1		3	
Toxicity	0 1 2 3	3		9	
Hazardous Waste Quantity	0 1 2 3 4 5 6 7 8	1		8	
	Total Waste Characteristics Score			20	
3 Targets					
Population Within 4-Mile Radius	0 9 12 15 18 21 24 27 30	1		30	
Distance to Sensitive Environment	0 1 2 3	2		6	
Land Use	0 1 2 3	1		3	
	Total Targets Score			39	
4 Multiply 1 x 2 x 3			0	35,100	0
5 Divide line 4 by 35,100 and multiply by 100		S_a =	0		0

02-8904-65-P
REV. No. 0

CONFIDENTIAL–NOT FOR PUBLIC RELEASE

HRS

	S	S^2
Groundwater Route Score (S_{gw})	0	0
Surface Water Route Score (S_{sw})	0	0
Air Route Score (S_a)	0	0
$S^2_{gw} + S^2_{sw} + S^2_a$		0
$\sqrt{S^2_{gw} + S^2_{sw} + S^2_a}$		0
$\sqrt{S^2_{gw} + S^2_{sw} + S^2_a}\,/\,1.73 = S_M =$		0

WORKSHEET FOR COMPUTING S_M

PRO

	S	S^2
Groundwater Route Score (S_{gw})	0	0
Surface Water Route Score (S_{sw})	2.05	0
Air Route Score (S_a)	0	0
$S^2_{gw} + S^2_{sw} + S^2_a$		4.20
$\sqrt{S^2_{gw} + S^2_{sw} + S^2_a}$		2.05
$\sqrt{S^2_{gw} + S^2_{sw} + S^2_a}\,/\,1.73 = S_M =$		1.18

WORKSHEET FOR COMPUTING S_M